

Radio Fun

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"The beginner's guide
to the exciting world
of amateur radio."

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Broadcast FAX

According to Electronic Engineering Times, NBC has formed a data network to broadcast information over the air in the VBI (vertical blanking interval) portion of the network's television-broadcast signal. The first commercial offering will be a facsimile service in cooperation with a London-based firm.

The encrypted addressable FAX will send to specially-equipped computers and FAX machines. One purpose will be to send company information to employees who work at their own homes. Similar technology has been used for years to deliver closed captioning data in the VBI. *TNX Electronic Engineering Times, November 14, 1994.*

W2SKE Dead at 78

Bill Leonard W2SKE, a former president of CBS News, died at his Laurel Maryland home on October 23, at age 78. Leonard was an avid DXer and contesteer in the '60s and '70s, and became a well-known spokesman for amateur radio. As president of CBS News, Leonard was credited with the selection of Dan Rather as "Evening News" anchor, as a

member of the team that developed "60 Minutes," and for development of techniques which help to predict the outcomes of elections.

During a 1981 interview, Leonard predicted that computers would become more a part of ham radio. He added, "My bet is that ham radio, in one form or another, will be around 100 years from now." *TNX Mohawk Amateur Radio Club, Inc. M.A.R.C. News, November, 1994; ARRL.*

Phase 3-D Project On Schedule

Members of AMSAT's Phase 3-D International Satellite Design Team met in Marburg, Germany, in mid-October for a "top-to-bottom" review of progress on ham radio's most advanced satellite. Dr. Karl Meinzer DJ4ZC and Werner Haas DJ5KQ hosted a series of detailed meetings on all systems and subsystems. During these discussions, team members bench-tested a number of flight hardware electronic items, and set the final operating frequencies for the spacecraft's transmitters and receivers.

"It was a marathon session," said AMSAT's Dick Jansson WD4FAB upon returning to the US. Team members are now very confident that all key elements of the project are on schedule and that the spacecraft's integration in Florida can continue without interruption.

Phase 3-D is slated for launch in 1996. The sophisticated bird will weigh nearly 900 pounds at launch and, after reaching orbit, will unfurl a solar-panel wingspan of nearly 20 feet.

Evening Breeze



Here's a tranquil scene reminiscent of summers past.
Chris Gonyea KB1AZK (age 12) enjoys a relaxing QSO
at a favorite spot near his grandparents's house
on Lake Sunapee, New Hampshire.

ORDER NOW 1-800 4 HOBBY KITS

AIRCRAFT RECEIVER



Hear exciting air-craft communications—pick up planes up to 100 miles away! Receives 110-136

MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.

AR-1 kit.....\$29.95 Matching case set, CAR...\$14.95

FM RECEIVERS & TRANSMITTER

Keep an ear on the local repeater, police, weather or just tune around. These sensitive superhet receivers are fun to build and use. Tunes any 5 MHz portion of the band and have smooth varactor tuning with AFC, dual conversion, ceramic filtering, squelch and plenty of speaker volume. Complete manual details how the rigs work and applications. 2M FM transmitter has 5W RF out, crystal control (146.52 included), pro-specs and data/mike inputs. Add our case sets for a nice finish.

FM Receiver kit Specify band: FR-146 (2M), FR-6 (6M), FR-10 (10M), FR-220 (220MHz).....\$29.95
CFR Matching case set.....\$14.95
FT-146 Two Meter FM transmitter kit.....\$79.95

MICRO-MIKE

World's smallest FM wireless mike. Smaller than a sugar cube - including battery and mike. Two sets of SMT parts supplied in case you are clumsy! Terrific audio pick-up (pin drop at 5 ft) and transmit range of 300 ft. We include the battery (watch style), electret mike and even a tuning tool! Be a James Bond and learn SMT too! FM-5 Micro mike kit.....\$19.95



FM WIRELESS MIKES

Pick the unit that's right for you. All units transmit a stable signal in the 88-108 MHz FM band up to 300' except for High power FM-4 and PB-1 Phone bug that go up to 1/2 mile.

FM-1 Basic unit.....\$5.95
FM-2, as above.....\$7.95
but with added mike pre amp.....\$14.95
FM-4, long range with very sensitive audio pickup.....\$14.95
PB-1, Phone bug needs no battery, hooks to phone line.....\$14.95
MC-1, Micro size sensitive mike cartridge for FM-1,2,4.....\$2.95

SURROUND-SOUND/REVERB

Add concert hall realism to your stereo, TV or even 2-way radio! Easily synthesize a stereo effect from mono sources or richly enliven regular music. Add a big-voice reverb to your radio voice that others will envy! Our reverb/surround sound kit uses a Bucket Brigade IC Device for reliable solid-state performance. Adjustable reverb, delay and mix controls to customize your sound. Easily connected to radios, stereos, CB's and TV's. Plenty of audio to drive a small speaker for stand-alone operation too. Experience the fun and realism that surround sound provides - without spending hundreds! Add our case set for a neat, pro look.

RV-1 Surround Sound/Reverb kit.....\$59.95 CRV Matching case set.....\$14.95
RV-1WT Assembled RV-1 and case.....\$99.95

TOUCH-TONE REMOTE CONTROL

Control virtually anything by Touch-Tone remote control. The URC-1 has 16 switched outputs, 4 adjustable voltage outputs (20 mV steps 0 to 5 VDC), two 10K digital pots (for volume, squelch, etc.) and 3 timers adjustable from 10 mS to 40 hours! Two level password control allows secure control and multi-level access. Six digit LED display shows currently entered codes and a crystal controlled touch-tone decoder provides reliable operation. There's nothing else like this unit, be in complete control of remote radios, thermostats, hi-fi's, homes or even factories with the URC-1. Add our matching case set for a handsome finish.

URC-1 Remote control kit.....\$129.95 CURC Matching case set.....\$14.95
URC-1WT Fully assembled URC-1 and case.....\$189.95

FM SUBCARRIER DECODER

Tap into the world of commercial-free music and data that is carried over many standard FM broadcast radio stations. Decoder hooks to the demodulator of FM radio and tunes the 50-100 KHz SCA subcarrier band. Many radios have a demod output, but if your radio doesn't, it's easy to locate, or use our FR-1 FM receiver kit which is a complete FM radio with a demod jack built-in. These "hidden" subcarriers carry lots of neat programming - from stock quotes to news to music, from rock to easy listening - all commercial free. Hear what you've been missing with the SCA-1.

SCA-1 Decoder kit.....\$27.95 CSCA Matching case set.....\$14.95
FR-1 FM receiver kit.....\$24.95 CFR Matching case for FR-1.....\$14.95

L-C METER

Measure inductors from 10 uH-10mH and capacitors from 2 pF-2uF with high accuracy by connecting the LC-1 to any digital multimeter. Two pushbutton ranges for high resolution readings and we even give you calibration components to assure proper accuracy of your kit! Active filters and switching supplies require critical values, no one should be without an accurate LC meter. For a pro look, add our matching case set.

LC-1 LC meter kit.....\$34.95 CLC case set.....\$14.95

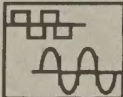
MOTOR CONTROLLER

Control the speed and direction of any motor. Use our SMD-1 for those nice steppers you see surplus, and our MSC-1 for DC motors. The stepper driver features variable speed, half step rotation, direction and power down mode, can drive most any stepper motor. Our DC driver features pulse width modulation control allowing full motor torque even at low speeds and can drive motors up to 50 VDC @ 10 Amps! Add our case set for a professional assembly.

SMD-1 Stepper kit.....\$24.95 MSC-1 DC motor kit.....\$24.95
CSMD SMD-1 case.....\$14.95 CMSC MSC-1 case.....\$14.95



SYNTHESIZED AUDIO GENERATOR



DDS (Direct Digital Synthesis) technology brings you a terrific audio generator at a fantastic price! Generates from 0.01 Hz to 50 KHz with five digit LED display of frequency. Sine and square wave output adjustable 0-5 volt p-p. Frequency selected by direct keyboard entry and with handy continuous tune tuning knob. Crystal controlled accuracy of 10 ppm and two memories for rapid frequency changes. Retire that jury-rigged old generator and treat yourself to the pleasure of using a new state-of-the-art SG-550!

SG-550 Kit.....\$199.95 SG-550WT assembled.....\$269.95

SHORTWAVE RECEIVER

Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4-11 MHz. True superhet, has smooth varactor tuning, AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project, provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3-22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!



Shortwave receiver kit, SR1.....\$29.95
Shortwave converter kit, SC1.....\$27.95
Matching case set for SR1, CSR.....\$14.95
Matching case set for SC1, CSC.....\$14.95

AM TRANSMITTER

High quality, true AM broadcast band transmitter is designed exactly like the big commercial rigs. Power of 100 mW, legal range of up to 1/4 mile. Accepts line level inputs from tape and CD players and mike mixers, tunable 550-1750 KHz. Complete manual explains circuitry, help with FCC regs and even antenna ideas. Be your own Rush Limbaugh or Rick Dees with the AM-1! Add our case set for a true station look.

AM-1 Transmitter kit.....\$24.95
CAM Matching case set.....\$14.95

SCANNER CONVERTER

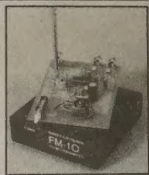
Tune in on the 800-950 MHz action using your existing scanner. Frequencies are converted with crystal referenced stability to the 400-550 MHz range. Instructions are even included on building high performance 900 MHz antennas. Well designed circuit features extensive filtering and convenient on-off/bypass switch. Easy one hour assembly or available fully assembled. Add our matching case set for a professional look.



SCN-1 Scanner converter kit.....\$49.95
SCN Matching case set.....\$14.95
SCN-1WT Assembled SCN-1 and case.....\$89.95

STEREO FM TRANSMITTER

Run your own Stereo FM radio station! Transmits a stable signal in the 88-108 MHz FM broadcast band up to 1 mile. Detailed manual provides helpful info on FCC regs, antenna ideas and range to expect. Latest design features adjustable line level inputs, pre-emphasis and crystal controlled subcarrier. Connects to any CD or tape player, mike mixer or radio. Includes free tuning tool too! For a pro look add our matching case set with on-board whip antenna.



FM-10A Stereo transmitter kit.....\$34.95
CFM Case, whip ant set.....\$14.95

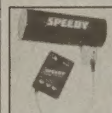
DR. NI-CAD CONDITIONER/FAST CHARGER

Quit spending big bucks for replacement battery packs, rejuvenate and condition your batteries for peak capacity. Advanced circuitry has optimized discharge before charge to eliminate memory effect and to condition batteries that have been poorly cared for in the past. Quick charge rapidly brings battery to full charge in less than an hour—just 15 minutes for some types! And "top-off" charge mode squeezes every last bit of energy into each cell for the absolute most capacity. Switch-mode regulator controls constant current charge while being monitored by a negative delta-V system that cuts off the fast charge at the exact point of full charge—batteries are charged, not cooked! Charges NiCads or NiMH packs from 2 to 10 cells (easily expanded) and current capacities up to 10 Amp-hours. Runs on 12 to 15 VDC. Quit cooking your batteries, buying new packs, waiting hours for recharge, get a Dr. Ni-Cad today! Available in money saving kit form or wired and tested with case at a special price. Kit builders: add our matching case set for a snazzy finish.

DN-1 Dr. Ni-Cad conditioner/fast charger kit.....\$49.95
CDN Matching case set.....\$14.95
DN-1WT Fully assembled Dr. Ni-Cad with case.....\$89.95

SPEED RADAR

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual Doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.



SG-7 Complete kit.....\$99.95

STEREO PEAK HOLD BARGRAPH

Finally a dual LED bar graph with a peak hold display! Bar graph displays are neat and eye catching but their speed is their downfall - they just can't capture the peaks. Our kit is like two units in one, a fast display to show the signal and a long persistence display to capture peaks, similar units go for hundreds of bucks! We offer 3 models: Linear for general use, Semi-Log for audio VU meters, and Log for power displays. Dual - for stereo! - 10 segment multi-colored LED display for snazzy, eye grabbing display and easily set ranges for virtually any signals, from voltmeters to audio VU meters to audio power amps to SWR meters. Complete instructions for easy hook-up to most any device. Add our matching case set for a sharp looking unit.

PH-14 Dual Linear bargraph kit.....\$39.95 PH-15 Dual Log bargraph kit.....\$39.95
PH-16 Dual Semi-Log bargraph kit.....\$39.95 CPH Matching case set.....\$14.95

SPEECH SCRAMBLER

Descramble most scramble systems heard on your scanner radio or set up your own scrambled communication system over the phone or radio. Latest 3rd generation IC is used for fantastic audio quality - equivalent to over 30 op-amps and mixers! Crystal controlled for crystal clear sound with a built-in 2 watt audio amp for direct radio hook-up. For scramble systems, each user has a unit for full duplex operation. Communicate in privacy with the SS-70. Add our case set for a fine professional finish.

SS-70 Scrambler/descramblerkit.....\$39.95
CSSD matching case set.....\$14.95
SS-70WT Assembled.....\$79.95

CRYSTAL RADIO

Relive the radio past with a crystal set like your grandfather built. Uses genuine Galena crystal and catwhisker. Several different types of radios are built, including standard AM broadcast, shortwave and even WW II foxhole style. To compare modern semiconductor detectors, we include a diode for comparison. No soldering required and we even give antenna ideas. Radio for free, get it now before Clinton taxes it!

CS-1 Crystal set kit.....\$19.95

TOUCH-TONE DECODER

Grab Touch-Tone numbers right off the air, phone or tape. A simple hook-up to any radio speaker or phone line is all that is required to instantly decipher touch-tone phone numbers or codes. A 256 digit memory stores decoded numbers and keeps its memory even in the event of power loss. An 8 digit LED display allows you to scroll through the memory bank to examine numbers. To make it easy to pick out number groups or codes, a "dash" is inserted between sets of digits that were decoded more than 2 seconds apart. A "central-office" quality crystal controlled decoder is used allowing rapid and reliable detection of numbers at up to 20 digits per second! For a professionally finished look, add our matching case set. Start cracking those secret codes tomorrow with the Tone Grabber!

TG-1 Tone Grabber kit.....\$99.95 CTG Matching case set.....\$14.95
TG-1WT Fully assembled TG-1 and case.....\$149.95

DIGITAL VOICE RECORDER

Chatterbox digital voice storage unit will record your message of up to 20 seconds. Time is split up into four 5 second blocks which can be played separately or cascaded for longer messages. An LED display shows message location and current mode for easy operation. Nifty built-in interfaces allow simple connection to transmitters for automatic keying when the PTT is initially closed or after it is released. You can even loop your rig's mike through the Chatterbox. For contest or fun use, the CB-1 can drive an external speaker. Includes a built-in electret mike. For that finishing touch, add our matching case set.

CB-1 Voice recorder kit.....\$59.95 CCB Matching case set.....\$14.95

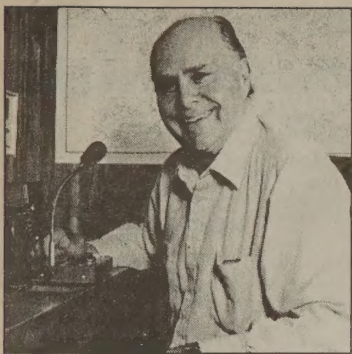
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TERMS: Satisfaction guaranteed. Examine for 10 days. If not pleased return in original form for refund. Add \$4.95 for shipping, handling and insurance. For foreign orders add 20% for surface mail. COD (U.S. only) add \$5.00. Orders under \$20 add \$3.00 NY residents add 7% sales tax. 90-day parts warranty on kit parts. 1-year parts & labor warranty on wired units.

RAMSEY ELECTRONICS, INC 793 CANNING PARKWAY VICTOR NY 14564

CIRCLE 34 ON READER SERVICE CARD



QLF

by Wayne Green W2NSD/1

Yes, *Radio Fun* Has Been Late

GUILTY, but with an explanation. When the cat's away the rats will play, and play they have. While I was busy having a good time starting a cold fusion magazine to try and speed up the development of what is now a laboratory curiosity into a new industry, some of my staff were busy trying to put 73 and *Radio Fun* out of business.

I and my executive committee were lulled into thinking things were okay with false financial reports which did not show that the company withholding taxes weren't being paid. Meanwhile, the plan, I'm told, was to get the IRS to close us down so the plotters could buy our publications at an IRS auction, getting the money from a well-known, but not well-thought-of, ham in return for a partnership.

Now let's see, where have I seen some 73 ex-employees quoted recently? With quotes whose only purpose seemed to be to try and put 73 out of business?

One part of this plot was to print *Radio Fun*, but then not mail it, leaving it sitting for weeks in the shipping department of the printer. Once the treachery was discovered and the plotters booted out, we had to pay off the IRS first. That's now been taken care of to the satisfaction of the IRS. The next step was to cut back on any projects which weren't solidly in the black, putting them on hold. Then we had to find out how much we owed other creditors that we didn't know about from the financial reports. It was a mess.

All this put a stop to my research and writing for the New Hampshire Economic Development Commission. The first series of my reports are available in *We The People Declare War On Our Lousy Government*, my 360-page book (only \$10 for hams from Uncle Wayne's Bookshelf). In these reports I explain why my state and our country are having serious problems such as welfare, the deficit, the drug war, worsening crime, a growing bureaucracy, higher taxes, simply awful schools, and an overly expensive health care system. But, unlike everyone else (particularly politicians) I propose fairly simple, inexpensive solutions to all of these problems.

The sabotage stopped me from finishing my second book of Commission reports, offering the results of more of my research and more solutions to our major social problems. When things quiet down I'll have the second book available. In the meanwhile, if you're interested in reading the reports, a set of them ("20/20 Foresight," 336 pages) is available for only \$10 from the Bookshelf.

It did not stop me from going ahead full steam with "*Cold Fusion*." By the way, we won the coveted *Folio* "Ozzie" award for the best designed new technical magazine of 1994. Tackling this new field was a massive learning project for me. These darned physicists think in terms of equations instead of concepts. I'm a concept person, so I've had to dust off my long-forgotten calculus and try to translate page after page of equations into concepts so I could understand them. That's tough for a

doddering semi-retired old fogey like me.

But it's worth the trouble because, no matter what you've read elsewhere, cold fusion is real and it's going to change the whole world in ways we can't even comprehend yet. What will the advent of almost free energy do? We've been so busy saving energy that we have never even considered what a world with unlimited energy for pennies might be like.

The cash shortage caused problems with "*Cold Fusion*" too. When its revenues came in at about 10% of projections, I had to go to a less expensive format. I also had to cut back on the staff and to part with the ham investor in the project, who apparently had a cash problem too. I like serendipity. Just as all this bad stuff was happening, a retired nuclear physicist (AB3C) with years of experience at Brookhaven, Bell Labs physics laboratories, and several universities, volunteered to move to New Hampshire to help.

Anyway, getting back to *Radio Fun*, when I found out that it was late I set about getting it back on schedule. We'll be caught up in a few weeks, so keep your socks on.

I'm particularly looking for articles to help new hams discover the fun of every phase of hamming. Let's get 'em out foxhunting, VHF mountaintopping, getting involved with DX and VHF contests, actually talking with DX ops, going on DXpeditions, learning about packet, slow-scan, RTTY, ham satellites, and so on. Whatever your main interest, what can you write that might communicate the excitement you are getting from it? How would you recommend newcomers get their feet wet?

There are a whole bunch of Caribbean islands just waiting for the more adventurous to zip down for a few days of working the pileups. And it doesn't have to cost much, either. For a measly \$7.50 you can read the 96-page report on my recent visit to 11 islands in 21 days, complete with hamming, meeting local hams, and even getting in some scuba diving on most of the islands. Wait! I have had time to edit the 8mm underwater videos I took and make VHS copies available for you. Check Uncle Wayne's Book-

shelf for the story of my Caribbean Adventures and see how a certified skindiving skinflint travels.

Remembering that the early birds in new technologies generally get better than worms, you might just want to keep track of how cold fusion is doing. Subscriptions to "*Cold Fusion*" are \$58 a year to *Radio Fun* readers, \$98 to everyone else. It's \$10 a copy. Bill Gates was the first to provide microcomputer software, and Steve Jobs was the first with a single board microcomputer (Apple). They've done well, eh? You know, there's much to be said for being there at the right time. But you're probably too busy to think about getting rich, and too poor to afford to buy my incredibly interesting writing, and too disinterested in politics to care about solutions to social problems or cutting taxes. Prove me wrong.

Cold fusion is going to grow into a multi-trillion dollar industry and have more impact on the world than even the automobile. It's going to change everything . . . and it isn't even started yet.

I remember, when I started the first microcomputer magazine 20 years ago that the computer pundits ridiculed micros as being toys. They were a joke. So I started more magazines. The sneerers were eventually put out of business by these "toys."

Before the latest trauma hit I was having fun researching, writing, giving talks at music conferences and hamfests, DXpeditioning, diving, and skiing. I had to drop most of that and get us out of hot water. It seems like I get in the most trouble when I trust people. I "manage" people by telling them what our goals are and then giving them their head.

I got backstabbed once before when Jim Fiske W1DTY was my general manager and editor and he tried to put 73 out of business when he left to start *Ham Radio*. He came very close to succeeding. You'd think I'd learn.

If I've talked you into getting some of my stuff, you can check the Uncle Wayne's ad, or just call 800-234-8458 with your credit card in hand.

RF

Are You a Newcomer?

Welcome! About 25% of the *Radio Fun* readers this month are new licensees, so as a "been-there, done-that" ham of over 50 years, I'm hoping that you'll have as much fun with your new hobby as I have had, and maybe it'll have as much of an influence on your life as it has had on mine. You could do worse. Probably will.

Back when I got hooked on the hobby, 80% of the newcomers were teenagers (like me), and 80% of them went on to high-tech careers (like me). Back then we were called "radio fiends." Back then amateur radio was the main source in America of electronic scientists, engineers, and technicians.

So here we are entering 1995 and here you are with your ham ticket. The main reason I started *Radio Fun* was to help newcomers find out how many exciting things there are to do in our hobby. Well, it's a whole bunch of hobbies, really. A whole bunch of ways to have fun and adventure. And the more fun you have, the more you'll learn about radio, electronics, and communications.

Today we're entering a communications age that would have been beyond the imagination of most science fiction writers 50 years ago. The information superhighway is opening and you've

got your ticket . . . if you use it. It's starting with the landline networks like Internet, CompuServe, Prodigy, and so on. But we're adding video, interactivity, paging, message storage, and bulletin boards . . . and soon these will be tied in with amateur radio.

There's tons more to learn today compared with the primitive radio world I entered in 1936 when I built my first radio. That radio was a turning point in my life. I'd been given a box of radio parts by a passing angel (it happened in church!). I found a circuit in *Popular Mechanics* that used these parts for a cigar-box radio. When it worked I was hooked. I bought more parts, built more radios and amplifiers. I started listening to the short waves and joined my high school radio club (W2ANU).

That got me to go to an engineering college. Came WWII and I joined the Navy as an electronic technician, where I got a superb education in electronics and five much-too-exciting war patrols on a submarine. After the War I finished college and went into radio broadcasting as an engineer, then into television, first as an engineer, then as a cameraman, and finally a director. All that as a result of a cardboard box of old radio parts.

So what are you going to do in amateur radio? Are you going to go on 2m, talking through a couple of local repeaters, and that's the end of it? Two meters has an amazing array of fun for you, if you'll give it a chance. Have you ever made aurora skip contacts? I guarantee you'll get about as excited as you ever have in your life when you start making aurora contacts. That's fun! And you can do it on CW or sideband!

What else is there on two? How about sideband? And, if your shack is in a lousy VHF location, as almost all are, then you'll be thinking about setting up a remote base, so you can make your contacts from a nearby mountaintop, or skyscraper. If you go that route I'll be after you to use 10 GHz for the control and intercom link. What a range you can have on sideband from up there!

Of course, once you set something like that up you may want to open it up so others can use it too, and you've got your own repeater. John Williams W2BFD and I set up our first repeater back in 1949 on top of the Municipal Building in downtown Manhattan. That made it so RTTY hams throughout greater New York City, New Jersey, Pennsylvania, and Connecticut could all be in contact. RTTY? That's radio teletype. And that's another bunch of fun you can have on two. RTTY is still perking along, as is packet radio, satellite communications, moonbounce, meteor bounce, and so on.

Yep, I'm going to try hard to get you to get involved with our ham satellites so you can start working some real DX. What a blast making contacts all around Europe and South America! Now you can work anywhere in the world via satellites. Doing all this is going to get you interested in learning more. It's fun and exciting to learn.

Or you may get involved with 2m foxhunting . . . building your own receiver and directional antennas that you can carry around hunting hidden transmitters. Then maybe you'll get your local ham club all involved, complete with making videos showing how much fun it is. You do the videos and I'll help you get copies to other ham clubs to get them hooked on foxhunting.

I used to have a ball taking my 2m stuff to the top of mountains and seeing how many contacts I could make. It was like my own contest. I tied a 16-element beam to the top of my car and set up on mountains all around New England. Eventually I set up my own 2m station high up on Mt. Monadnock in New Hampshire, with a kilowatt and a 336-element beam. Lordy, I had a signal! Well, I said that amateur radio had hooked me.

The *Radio Fun* Purpose . . .

. . . is to get you hooked on more and more

Continued on page 7

The Hamtronics R76-M Receiver Kit

by John R. Bolduc N1QGS

The Hamtronics R76-M narrowband VHF monitor receiver kit is a low-cost kit with versions that cover the 28, 50, 73, 144, 150, and 220 MHz bands. The 2 meter version is the one these nimble fingers built. The unit works well on 2 meters and covers adjacent frequencies that include commercial and police and fire frequencies. My interest in building this kit tweaked up a notch because I not only listen to the ham bands, I'm also an avid listener of local fire departments.

Since I had not built a kit in ages, I was pleased to find a neatly drawn and easy to follow schematic diagram. The parts list contained just about one hundred components. I love kit building, except for my usual weak spot—matching locations on the PC board with the board layout artwork. However, this Hamtronics kit includes well-drawn artwork, which helped to alleviate this problem.

Should you decide to build one of these kits, here is a suggestion you might consider: Order the optional A24 five-channel adapter kit. This will allow you to monitor more than one frequency with your receiver.

You should read all documentation included with the kit before starting actual assembly. The instructions were plainly written as far as building and tuning procedures were concerned. I found it necessary to employ the troubleshooting techniques section on two different occasions. There were no measurements required or recommended to be taken during the building of the kit. A friend of mine, and fellow engineer, stated that the Heathkits, in years gone by, usually had the builder taking voltage and resistance measurements as the project progressed. However, he also stated that with a basic receiver kit like this one, it probably wasn't necessary to take measurements until the end.

I started the building stage of the project by laying out all of the components and tabulating an inventory of parts versus the parts list. Note that moderate care needs to be taken when handling the NEC 41137 GaAs-FETs. You don't want to blow a component accidentally! The circuit board itself is the size of a 3.5-inch computer disk. Another interested engineer friend suggested that I employ double-sided tape to keep the parts in order and prevent them from getting lost in the shuffle. I should have taken his advice. A resistor seemed to be missing when its turn to be inserted was due. After the kit was completely built, I found the little bugger lodged in a crack in the floor. Fortunately, the resistor was of a common value and was easily replaced. Let me emphasize that the kit did contain all the parts on the list.

Well, as it turns out, nimble typing fingers do not necessarily translate into nimble assembly fingers. Luckily, the Hamtronics kit PC board is laid out well, so my fingers did not have to perform digit gymnastics for component placement. The only artwork difficulty I had was with three adjacent capacitors not having their polarity indicated on the drawing. A quick survey of the PC board and schematic indicated proper orientation for these components. I also found out telephone assistance was readily available.

Alignment can be done by two different methods. One method involves the use of a digital voltmeter, and the other by taking SINAD measurements. I did happen to have a professional SINAD meter at my disposal. This testing indicated sensitivity is excellent with this kit. The intermodulation problems I usually have with receivers at my home base were nonexistent. Although a little patience in alignment was necessary, the sensitivity obtained was excellent, as advertised.

The Insides

The heart of the R76M kit is the MC3357 chip. This chip consolidates many of the receiving functions into one small six-pin pack-

age. The MC3357 contains circuitry for the oscillator, mixer, RF amplifier, discriminator, and squelch. This chip also can be used in scanning receivers, according to my Motorola data book. The squelch circuit provides 100 mV of hysteresis so that on weak signals the squelch won't keep popping in and out.

Handling the audio is an LM-380. The engineer looking over my shoulder (yes, they're everywhere) tells me that that is a popular low-cost audio amplifier finding uses in many consumer products such as televisions, tape players and intercoms. Although this is a 14-pin chip, six of the pins appear not to be used in this application. Pins 3, 4, 5 and 10, 11, and 12, however, do serve a purpose. Tied to ground, they collectively act as a heat sink. The LM-380 is capable of producing about 2-1/2 watts of power to your 8-ohm speaker. In home use, this is more than adequate audio power.

Overall, this Hamtronics R76M kit performs as advertised, and assembles quite nicely. I found an occasion to call Hamtronics with a few questions and they were very receptive and helpful. If you are looking for a dedicated, sensitive, and easy to build monitor, you will enjoy building the Hamtronics R76M kit.

RF



Photo A. Assembly of the R76-M Kit began with unpacking at a suitable workspace.

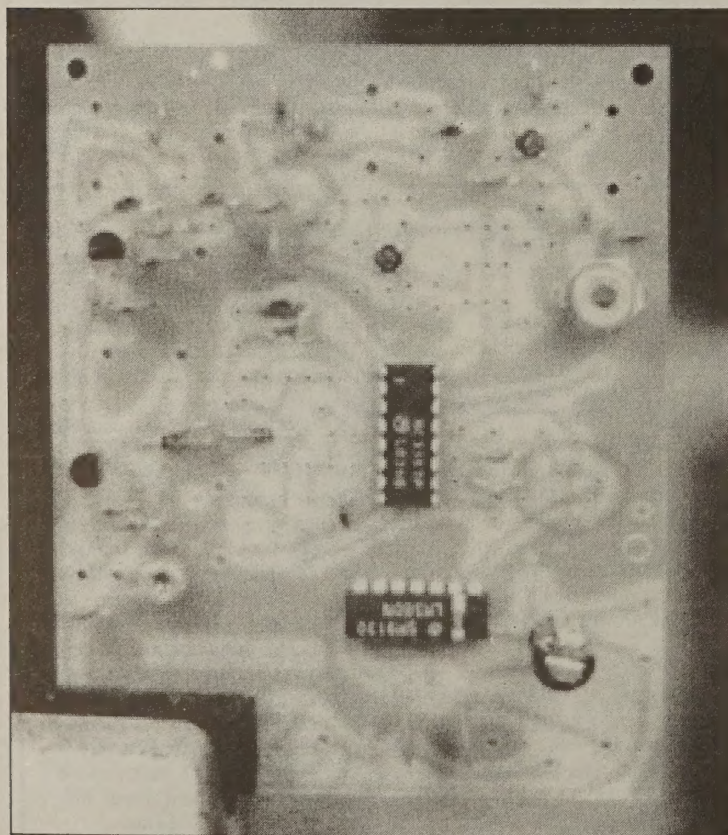


Photo B. The Hamtronics PC board was high quality and the markings were easy to follow.

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letters

Write to: Radio Fun Letters
70 Route 202-N, Peterborough, NH 03458



Kevin Ross Holen, Princeton MN Wayne, I would like you to know that I thoroughly enjoy your magazines and subscribe to both 73 and Radio Fun. I have been a ham now for about three years, and started off as a "dreaded Technician." I have always wanted to be a ham, and have even studied for it as a kid. I grew up in a ham-based family—my father was a ham and my uncle is still active. In fact, one of my fondest Christmas presents was an old National NC-109 shortwave receiver, which I still own! I have now upgraded to Advanced, and I'm even considering going to Extra!

Since you seem to be quite successful in your various business ventures, I would like your valuable advice. I would like to start a small business combining aviation and ham radio. I have experience in both and love each with a passion. What are your thoughts on such a venture? Currently I work as a quality assurance engineer for a big mail order firm here in the Twin Cities. I also have extensive experience in customer service and telemarketing, and have dabbled in different industries such as health care, and as a rose grower, so dealing with the public is not a problem for me. One of the obstacles holding me

back is trying to line up vendors to purchase items from. The Kenwoods and Icoms of the world don't seem to have the time of day for start-up guys like myself. Again, I appreciate any advice you can give.

Kevin—I'd suggest you find a small company that is in the aviation business and let them pay you to learn. Once you've found a suitable small business, talk with some of the people who work there (like take them to lunch) and find out what needs the owner has. What are his problems? Then come in with proposed solutions to his problems and you've made a job for yourself. That's a whole lot better than waiting around for a job to open up.

Every company has needs, so it's just a matter of your finding out what they are, coming up with a good plan, and selling the plan and yourself to the owner. If you can make more money for his company than you'll cost (like 10 times), you'll get the spot. If you can't figure out a way to do that, you shouldn't be aiming to start your own business. I guarantee I can make an extra \$500,000 in sales for any small company, and that's worth \$50,000. Not bad money while you're building your own experience and skills. . . . Wayne

Guy A. Matzinger KB7PNQ, Cheney WA Wayne, although I enjoy your publications, I see no evidence that you are truly interested in relieving the amateur community of the Morse code testing problem.

At a recent ARRL convention in Texas, John B. Johnston, (FCC Personal Radio Branch Chief (and licensed Extra Class W3BE) stated, "the FCC does not care about the code. That all their polls showed that the amateurs wanted the requirements to remain as they are." There are several problems with this statement. The FCC has never conducted a national poll of all licensed amateurs. The majority of those in the room who heard Johnston's remark responded, "Not me." The only organization pushing to maintain the code as it stands is the ARRL, in order to sustain the exclusivity filter that mandatory licensing requirements provide, in order to limit participation in the hobby of amateur radio. If you will check the record, you will find that no petition has been passed in recent years without the approval of the ARRL. The ARRL considers that all of the amateur radio spectrum is for their private and (if possible) exclusive use. Their surveys are conducted only with Extra Class amateurs.

It's time that the country realized who is running the Private Radio Bureau at the FCC, in direct opposition to the FCC's Office of Plans and Policy—reference Working Paper number 20 of August 20, 1986. The current code testing regulations are used by the ARRL group as a filter to limit and control access to amateur HF bands—to the detriment of amateur radio.

Troublemaker . . . Wayne

RF

WØGFQ in QCWA Hall of Fame

Leo Intone Meyerson WØGFQ was inducted into the Quarter Century Wireless Association's Hall of Fame at the 1994 National Convention. Meyerson has been an avid operator and promoter of ham radio since he received his first license in 1928.

Meyerson founded several amateur radio related companies, including Wholesale Radio Laboratories in 1935, and Galaxy Electronics in 1962. Active in public service, Meyerson has also been a key figure in disaster relief efforts. *TNX Jim Musgrove K5BZH.*

New Paging Licenses

According to an article in Electronic Engineering Times, The Federal Communications Commission's auction of 30 regional licenses for advanced paging services has been completed, with bids totaling some \$489 million. The government expects to net \$394 million.

Six licenses were issues in each of five regions from the narrowband wireless auctions. Each region will soon have will have two licensees ready to deliver two-way voice-quality communications and four others equipped for two-way paging. *TNX Electronic Engineering Times, November 14, 1994.*

Photos B & C. Thirteen-year-old Ben Vlug AD4UR logged more than 100 contacts during a recent Civil War reenactment in Roanoke County, Virginia. The Extra Class ham is a member of the Roanoke Valley Amateur Radio Club, sponsor of this Special Events station. A 24-thousand-pound Kinsey sign crane lumbered into Green Hill Park to set up this tribander beam some 75 feet in the air. The Battle of Hunter's Raid was revisited, while 43 states and more than 500 contacts were made. *TNX Mark Green KEAFPL.*

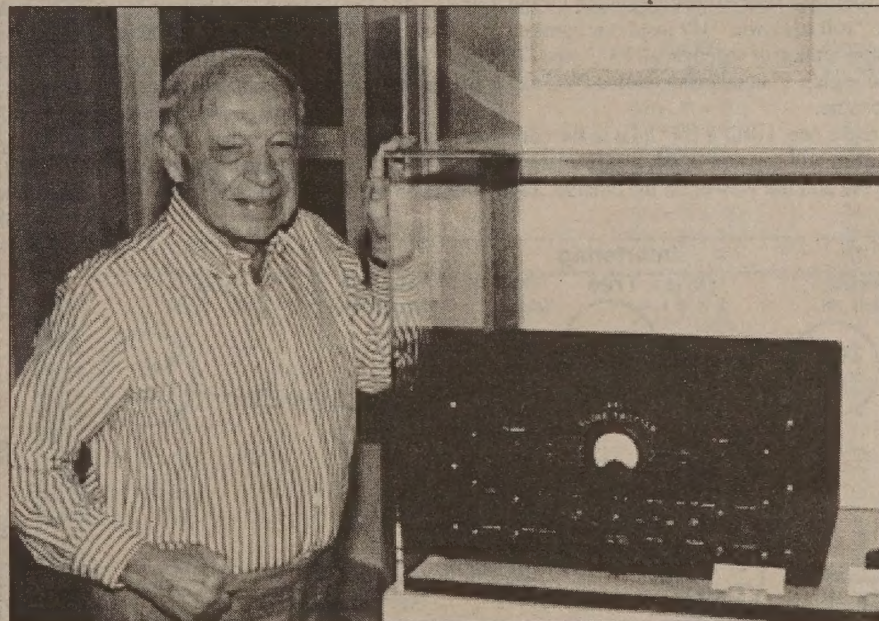


Photo A. QCWA Hall of Famer Leo Meyerson WØGFQ at the Western Heritage Museum in Omaha, NB. (Photo by Jim Musgrove K5BZH.)



Trees—And How to Live With Them

by Arthur C. White

Several years ago I graduated from a small city lot to a remote spot in the country where there are lots of trees. Consequently, my interests changed from quads and yagis to wire antennas and the ability to get on the lower bands in a reasonable and inexpensive fashion.

This is a discussion of how I managed to live with the trees. There is absolutely nothing new written here and there may be better ways to do things. But, this is must-read information for ham radio newcomers.

At present, my HF "antenna farm" consists of a single end-fed horizontal wire, a center-fed dipole and a horizontal loop. Because of their generous lengths and the use of a transmatch, all are capable of respectable all-band operation in spite of being pretty well-hidden amongst trees.

My basics are wire, insulators, rope, trees and patience. All my skywire consists of #12 ordinary plastic-coated house wire, which is available in convenient 500-foot rolls, black or white. Mine is white because my vision needs all the help it can get amongst green leaves in summer and dark branches in winter. Whatever substitute you have on hand may serve just as well.

Insulators

The next basic requirement is insulators. The easiest and least expensive source for me was to "roll my own." My insulator consists of a short section of schedule 40 PVC pipe (7" is about right), 1" in diameter, with a PVC cap on each end.

To make one, I drill a 1/4" hole in the center of each end cap and insert a 1/4" eyebolt with a nut and flat washer on the outside, and

a flat washer, lock washer and nut on the inside. (The "eye" of the eyebolt is about 9/16"). Then, with standard PVC cleaner and cement, glue the end caps onto each end of the PVC pipe, being sure to press the end caps tightly together for several seconds when the second end cap is glued (if you don't, the air pressure inside the pipe may pop it off). I advise finishing up by spraying the exposed metal with a can of undercoating from the local auto parts store (or paint or whatever) to minimize corrosion and to seal the hole which has been drilled into the end cap (see Figure 1).

These insulators are easy to build, inexpensive, and can be mass-produced several at a time. A number of mine have been up for several years, have experienced severe winter storms and intense summer sun, and have withstood all the tensions which insulators have to stand, and not a single one has failed. The same

can be said of the wire. I have some pretty long spans, but have never experienced a broken wire.

I like Lew McCoy W1ICP's advice about wire antennas: Find two trees as far apart as you can, stretch a wire between them, feed it in the middle, tune it with a transmatch and you are in business on all HF bands. This is what I have done, with a slight modification. Finding the first tree was no problem. The second tree was the right distance away but the wire would have to pass through the middle of another tree to get there, and my wife wouldn't let me cut it down. A solution was reached by anchoring to two trees instead of one (see Figure 2).

The tower adjacent to my shack was midway along the length of the wire. Near the top of the tower is an 8-foot yardarm—a sturdy pipe. On each end of the yardarm there is a pulley. The yardarm is off-center about five feet on one side of the tower and two feet on

the other. The pulley on the five-foot side is used to raise and lower my 3 x 5 American flag. The pulley on the two-foot end is used to raise and lower (at about three-year intervals) the insulator at the mid-point of my dipole. An open-wire line drops down to the shack (Figure 3) and connects to a pair of feed-through insulators made up of 2-1/2" PVC end caps (see Figure 4). An appropriate length of 1/4" threaded rod holds them together with suitable washers and nuts.

To illustrate typical problems with regard to trees, let me describe my 160 meter horizontal loop. Figure 5 shows the approximate shape. Why so weird? Because that's where the trees are. Figure 11 shows more detail, but we'll get to that.

A rope over the tree at point A ties to the initial insulator. At right angles, and fastened to the same insulator, is a rope to a pulley situated partway up my tower. By means of these two ropes, the location of an open-wire line which drops down to my shack a short distance along the wire headed towards the tree at B, can be controlled (see Figure 6).

Upon arrival at tree B (see Figure 7), the wire passes freely through a double-ended clip (Figure 8), and continues on after a roughly 90-degree change of direction. The other end of the clip attaches to the insulator. To the other end of the insulator, two ropes are tied. One goes over the tree to support the antenna and the other hangs loosely to the ground. The reason for this is that frequently when a rope has

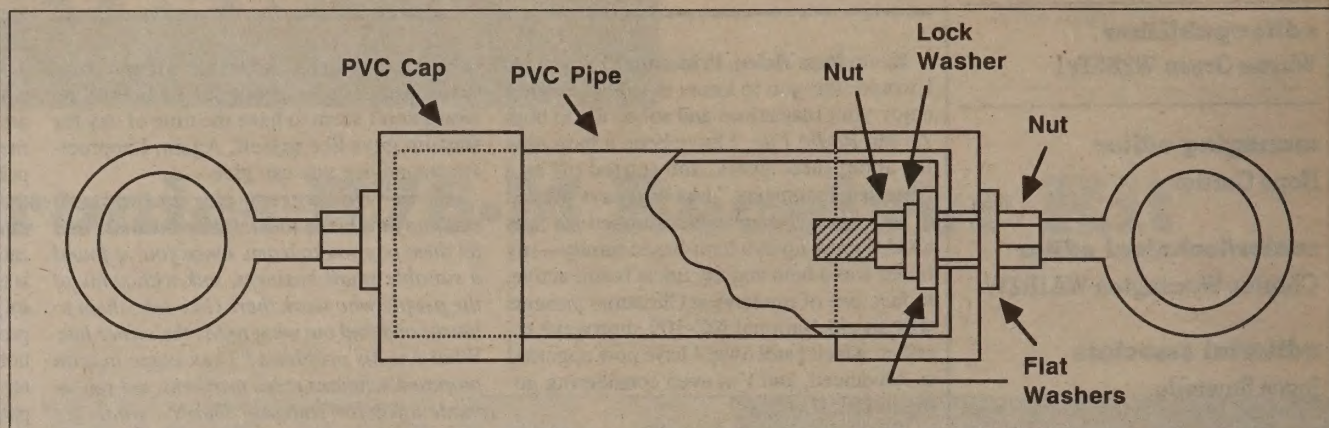


Figure 1. A home-brew antenna insulator.

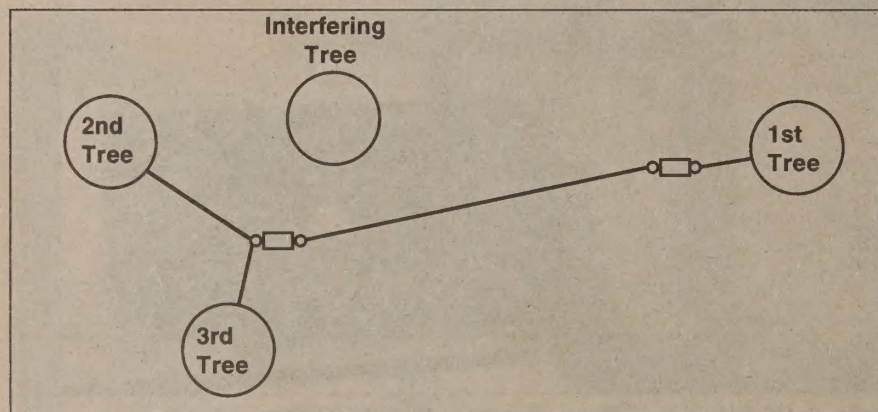


Figure 2. Snaking around trees.

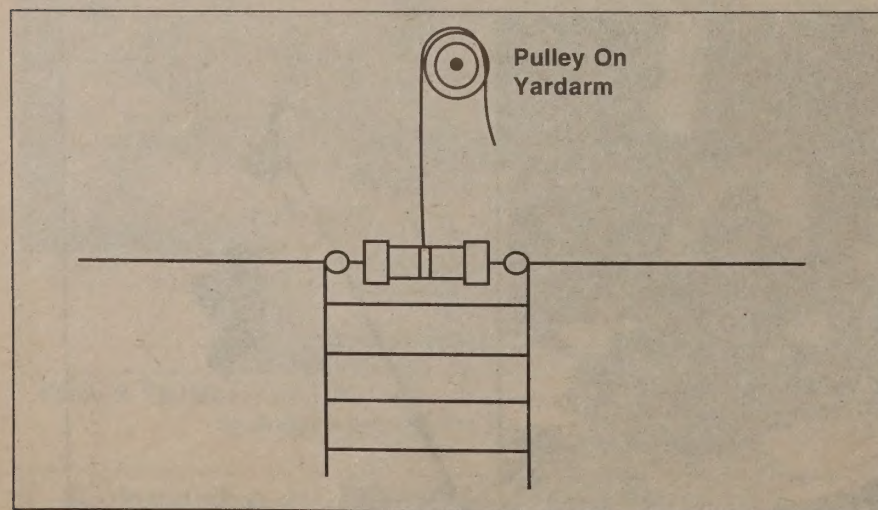


Figure 3. Pulley on yardarm technique (see text).

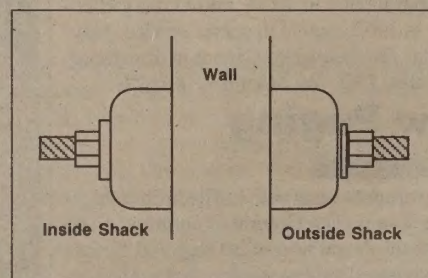


Figure 4. Feed-through insulators.

Continued on page 8

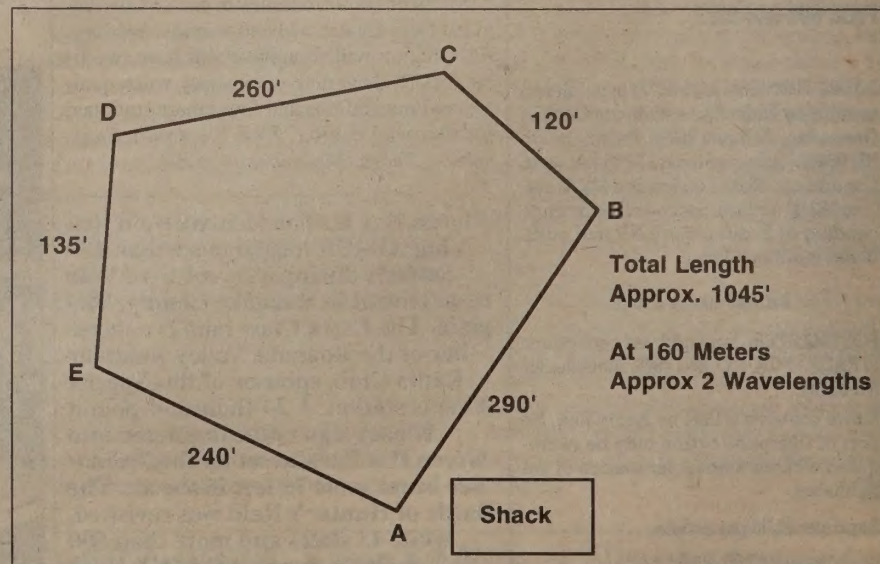


Figure 5. A strange shape for a 160 meter horizontal loop.

Newcomer

Continued from page 3

fun things you can do in amateur radio. I want to get you excited about RTTY, slow-scan, packet, and all the rest. I want you to have as many adventures as I have. Maybe more, if possible. I've been on some hairy DXpeditions where I came close to getting killed. But they were super fun too.

In the old days I could go down to Courtlandt Street in New York and buy parts to build just about anything. Then, after the War, came surplus. Wow! I filled my cellar and four neighbors' garages with surplus electronic equipment. Tubes? I had hundreds of 'em, from acorn and peanut tubes on up to huge transmitting tubes. You need an 833? No problem.

These days you have to buy kits if you're going to build. With more and more hams finding out how much fun it is to build we're seeing lots of new kits coming available. Every time you buy a kit and build it I expect you to keep notes and let me know what problems you've had, and how much fun. You let me know, and I'll pass along the word to help others.

Once I've hooked you into trying some new aspect of amateur radio through *Radio Fun* I expect you to do your bit to get others hooked. I want articles, letters, and photographs. What I don't want is for you to end up like several thousand old-timers, swapping signal reports and reciting the same old baloney for years. Or just rag-chewing. You have an incredible opportunity for adventure... for excitement... for fun, and I'm going to do what I can to get you to see how much fun there is to have.

Subscribe

You'll only be getting a couple of sample issues of *Radio Fun*, so I'm hoping you will quickly subscribe and not let your normal procrastination separate us. It only costs \$13 to subscribe. Heck, make that \$25 for two years so I won't have to waste postage getting you to renew next year. You'll then be getting a monthly shot of excitement and encouragement to try new bands, new modes, and new fun. You don't want to miss my story of operating from YK1AA's shack in Damascus, do you? Or from Katmandu and 9N1MM?

And while you're at it, I also want you to subscribe to 73. The downside is that my editorials are longer. The upside is that it's a bigger magazine and packed with reviews of new equipment (more than any other ham magazine by far), and lots of articles that will help you learn more about slow-scan, packet, antennas, and so on. 73 is the magazine for active hams. It's only \$20 a year. I started it back in 1960 and for some reason it's still going. So here I am, a living link with the past. But I'm also, as I said, a been-there, done-that editor.

I've worked seven states on 10 GHz. I've represented America at the ITU in Geneva. I've been on two around the world DXpeditions. Oh heck, you don't want to read about all my stuff, what you want to do is get busy and start having your own adventures. You can read about mine in *Radio Fun* and 73. And, if I can ever get you to write and take some pictures, maybe I'll be printing your stories of DXpeditions, getting new hams licensed, and adventures on our satellites. Maybe you'll send me some DX color photos you've gotten via slow-

scan. Or lists of the DX you've worked on 160m and 80m. Or perhaps I'll work you when you're visiting 3D6 or 7P8. Yep, I'll tell you I been-there, done-that.

Subscribe for a Friend

Is there someone you know who's interested in hamming? You could do worse than get their juices going with a gift subscription to

Radio Fun. For \$25 you can sign up two friends and give them monthly reminders that you are thinking of them. It might get them busy getting their tickets, or getting involved with more adventure, if they are already licensed. That's about what you spend going to the movies, right? Or for one dinner out. You might just turn out to be the angel who turns some youngster's life around by getting him or her

involved with amateur radio.

The chap who brought that box of old radio parts into the Dutch Reformed Church in Brooklyn back in 1936 is long gone, but the mischief he caused lives on and you can enjoy the results in my magazines. So polish up your halo and give some gift subscriptions to *Radio Fun*. Give yourself one too.

RF



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MODEL VS-50M

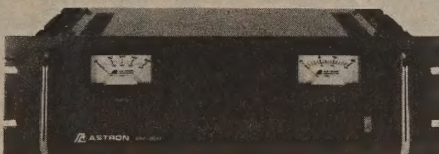
SL SERIES



RS-L SERIES



RM SERIES



MODEL RM-35M

RS-A SERIES



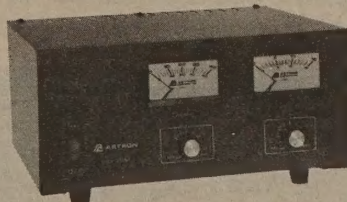
MODEL RS-7A

RS-M SERIES



MODEL RS-35M

VS-M AND VRM-M SERIES



MODEL VS-35M

RS-S SERIES



MODEL RS-12S

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• LOW PROFILE POWER SUPPLY

MODEL	Colors Gray Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
SL-11A	• •	7	11	2 5/8 x 7 1/2 x 9 3/4	12
SL-11R	• •	7	11	2 5/8 x 7 x 9 3/4	12
SL-11S	• •	7	11	2 5/8 x 7 1/2 x 9 3/4	12
SL-11R-RA	• •	7	11	4 3/4 x 7 x 9 3/4	13

• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-4L	3	4	3 1/2 x 6 1/2 x 7 1/4	6
RS-5L	4	5	3 1/2 x 6 1/2 x 7 1/4	7

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RM-12A	9	12	5 1/4 x 19 x 8 1/4	16
RM-35A	25	35	5 1/4 x 19 x 12 1/2	38
RM-50A	37	50	5 1/4 x 19 x 12 1/2	50
RM-60A	50	55	7 x 19 x 12 1/2	60

• Separate Volt and Amp Meters

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RM-12M	9	12	5 1/4 x 19 x 8 1/4	16
RM-35M	25	35	5 1/4 x 19 x 12 1/2	38
RM-50M	37	50	5 1/4 x 19 x 12 1/2	50
RM-60M	50	55	7 x 19 x 12 1/2	60

MODEL	Colors Gray Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-3A	• •	2.5	3	3 x 4 1/4 x 5 1/4	4
RS-4A	• •	3	4	3 3/4 x 6 1/2 x 9	5
RS-5A	• •	4	5	3 1/2 x 6 1/2 x 7 1/4	7
RS-7A	• •	5	7	3 3/4 x 6 1/2 x 9	9
RS-7B	• •	5	7	4 x 7 1/2 x 10 3/4	10
RS-10A	• •	7.5	10	4 x 7 1/2 x 10 3/4	11
RS-12A	• •	9	12	4 1/2 x 8 x 9	13
RS-12B	• •	9	12	4 x 7 1/2 x 10 3/4	13
RS-20A	• •	16	20	5 x 9 x 10 1/2	18
RS-35A	• •	25	35	5 x 11 x 11	27
RS-50A	• •	37	50	6 x 13 3/4 x 11	46
RS-70A	• •	57	70	6 x 13 3/4 x 12 1/4	48

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter RS-12M	9	12	4 1/2 x 8 x 9	13
• Separate volt and Amp meters RS-20M	16	20	5 x 9 x 10 1/2	18
RS-35M	25	35	5 x 11 x 11	27
RS-50M	37	50	6 x 13 3/4 x 11	46
RS-70M	57	70	6 x 13 3/4 x 12 1/4	48

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
	@13.8VDC @10VDC @5VDC	@13.8V		
VS-12M	9 5 2	12	4 1/2 x 8 x 9	13
VS-20M	16 9 4	20	5 x 9 x 10 1/2	20
VS-35M	25 15 7	35	5 x 11 x 11	29
VS-50M	37 22 10	50	6 x 13 3/4 x 11	46

• Variable rack mount power supplies

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
VRM-35M	25	35	5 1/4 x 19 x 12 1/2	38
VRM-50M	37	50	5 1/4 x 19 x 12 1/2	50

• Built in speaker

MODEL	Colors Gray Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H x W x D	Shipping Wt. (lbs.)
RS-7S	• •	5	7	4 x 7 1/2 x 10 3/4	10
RS-10S	• •	7.5	10	4 x 7 1/2 x 10 3/4	12
RS-12S	• •	9	12	4 1/2 x 8 x 9	13
RS-20S	• •	16	20	5 x 9 x 10 1/2	18
SL-11S	• •	7	11	2 5/8 x 7 1/2 x 9 3/4	12

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

Trees—And How to Live With Them

Continued from page 6

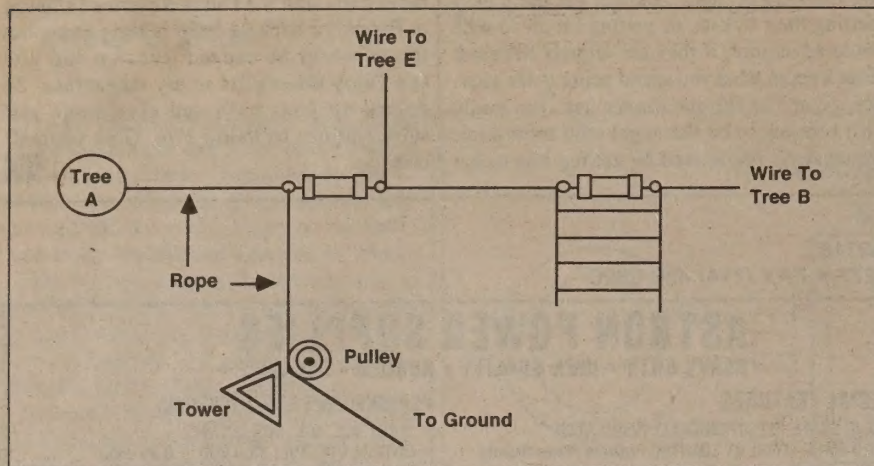


Figure 6. Setup to control an open-wire line.

lain in the crotch of a tree for a period of time the tree grows around it, and without this additional down-lead rope to pull on, there is no convenient way to get the antenna down. By exercising the ropes occasionally, the rope in the tree can be kept loose. Older trees don't seem to have this problem.

Another factor worth mentioning here is that if the tree sways a lot it may be an advantage to have a flexible fastening point for the supporting rope. Instead of fastening the end of the rope to something solid, like a tree trunk, a heavy weight (such as one to three old-fashioned iron window weights) works fine. On a normal tree, and using nylon rope, which has a lot of natural "stretch," weights are not needed.

The next tethering point, at tree C, was handled just as at tree B, except that the wire was pulled out of the way of an interfering tree F by a lateral insulator using the double-ended clip and down-lead rope (see Figure 9).

The treatment at tree D is the same as at B.

However, there was a tree to be avoided along the way. Because the span was so long, the interfering tree, G, was used for support, and another tree, nearly 100 feet off to the side, was used to position the wire (see Figure 10).

To make a long story short, the configuration at B was repeated at C, D and E; that at F was repeated at H; and that at G was repeated at I and J. The resulting shape of my loop is shown in Figure 11. I have no idea of the radiation patterns but I love this antenna even though it is not very high and in spots it is smothered by trees.

One important aspect of all this is getting the rope up in the tree. Usually you want it up as high as you can get it, which means getting it over the topmost part of the tree. I have tried several methods with varying degrees of success.

1. I tied a socket (from a socket wrench set) to the end of a sturdy string, which was then laid out on the ground in a clear area. By swing-

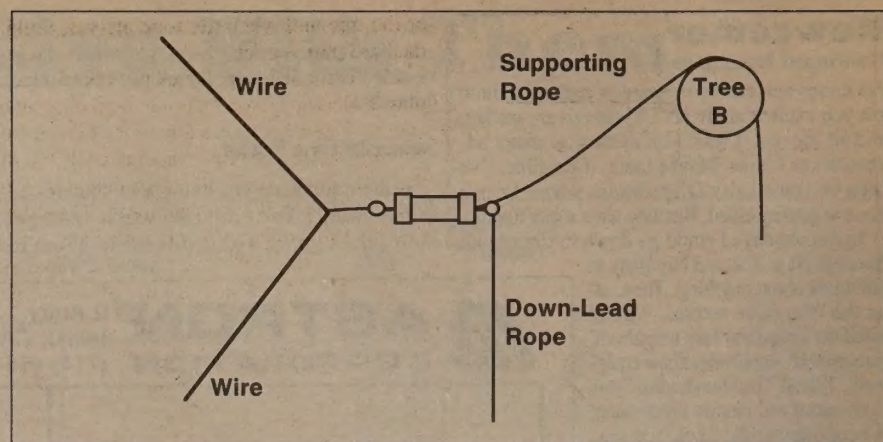


Figure 7. Configuration at Tree B (see text).

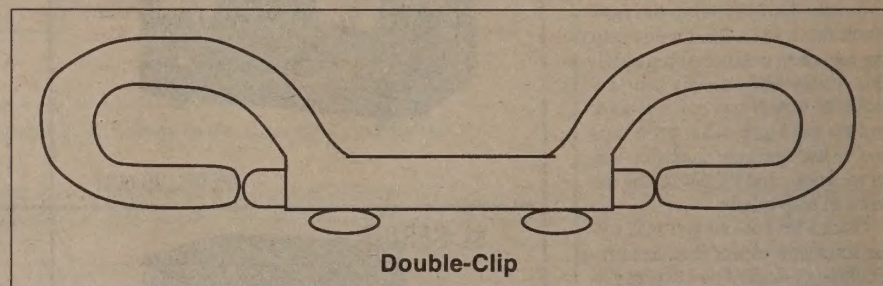


Figure 8. Double-ended dog-leash style clip.

ing the socket rapidly (like an airplane propeller) at the end of a three-foot length of string, and letting go at precisely the right instant, the socket sails over the top of the tree. That's the good part. The bad part is that out in the woods there is no room to swing the socket. Assuming you have found a clear spot, when the socket is on the way down after you have thrown it, it frequently wraps itself around a branch (several times)—so cut the string, fetch another socket, and try again. After you have swung the socket for its trip over the tree, a tuft of grass or twig or anything that the string on the ground encounters will snag the string, aborting the attempt. I had about two complete socket sets hanging from branches like Christmas tree ornaments while using this method. Reference A suggests winding the string around a circle of nails driven into a board, which would alleviate the snagging problem.

2. At a local hamfest I bought a small crossbow which fired darts. A small fishing reel was fastened to the front of the crossbow with

a hose clamp. When the line in the fishing reel was tied to a dart, it worked beautifully, except it didn't have enough punch to make it over the top of a tall tree.

3. One of my sons who was here on a visit was handy with an ordinary bow. Using a fishing reel placed on the ground with a line tied to the arrow worked great, although there are still a couple of arrows swinging in the breeze amongst some trees.

4. I have a crossbow, which has the disadvantage of no control over its velocity, and is capable of sending arrows into the next county, and often snapped the fishing line as it commenced its journey. Even when it worked OK, the arrow would fly so high that the slightest breeze would blow the fishing line way off target and come to rest over the wrong tree. Finding an arrow in the woods when you can't even see the fishing line leading to it is an additional frustration.

5. My preferred method is to use a slingshot with a one-ounce lead fishing weight attached

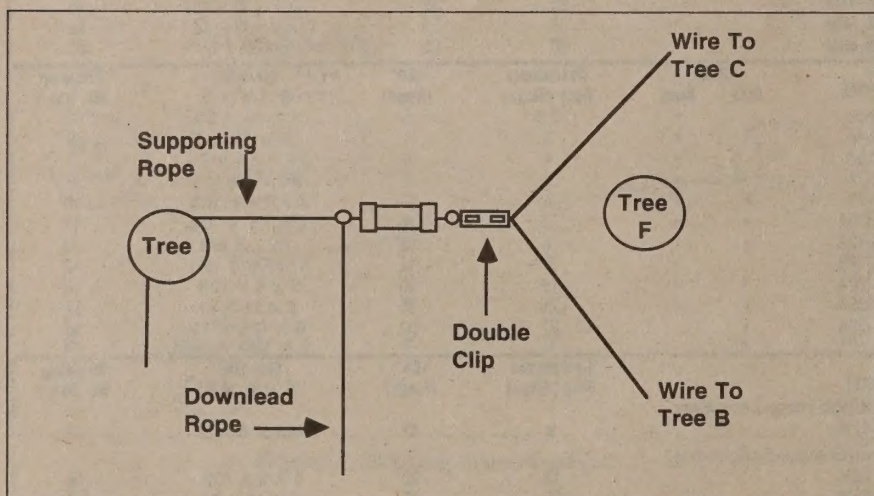


Figure 9. Avoiding Tree F.

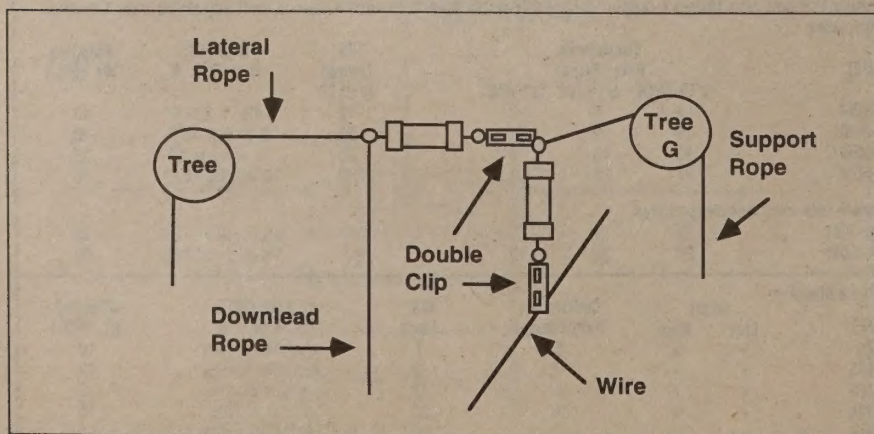


Figure 10. Trees used to position the wire.

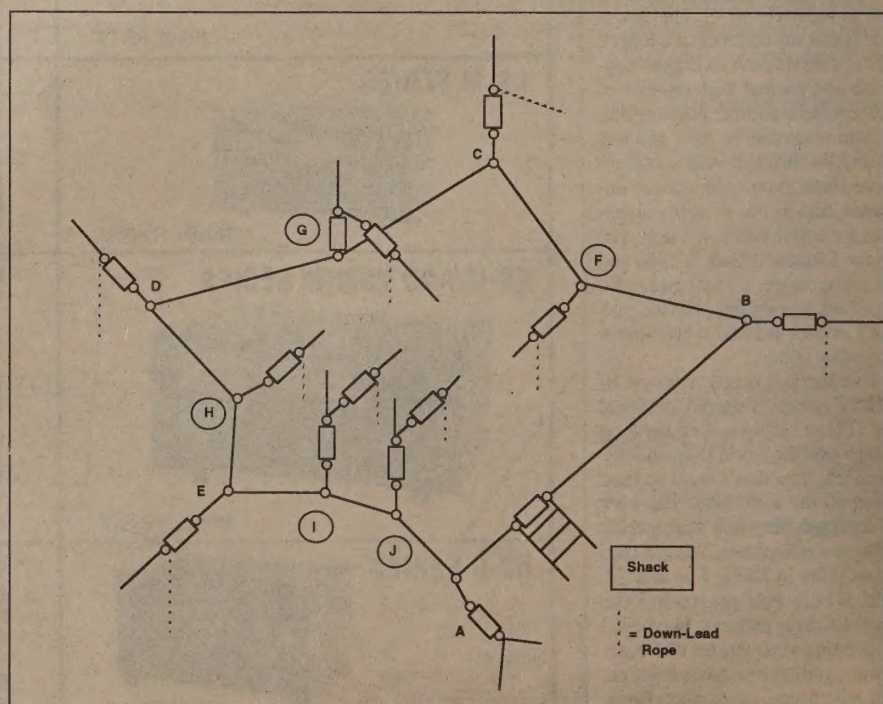


Figure 11. Wire antenna detail.

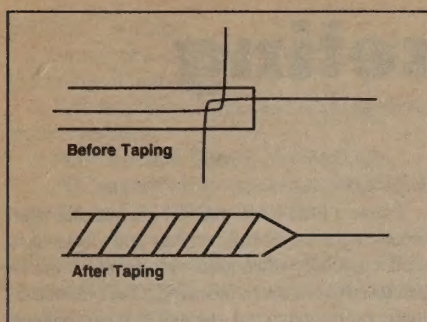


Figure 12. Before and after taping.

to a 15-pound test fishing line, with the fishing reel lying on the ground. This offers total control and great accuracy. If desired, the fishing reel can be taped to a suitable wooden dowel with the back end sharpened so it can be pushed easily into the ground. After the lead weight has been shot over the tree and located on the other side, it is removed and a stout cord is tied in its place at the end of the fishing line. The fishing line is then reeled in, and when the cord arrives the fishing line is removed and the nylon rope is tied to the cord. The cord is then pulled in at the opposite side

of the tree and when the rope arrives, voilà, the hard part is over.

Life is made easier by using lots of black plastic electrical tape. In tying the fishing line and cord together, it is a good idea to tape the junction so that there is a taper at each end of the junction. By so doing, it can be pulled in either direction without jamming. The same thing is true when joining the cord and rope. To avoid bulk, a single (or more if it makes you feel better) half hitch of the cord near the end of the rope, when smoothly taped over, works fine (see Figure 12).

When extending the length of a rope, a half-hitch in each rope where they join, with the ends taped, keeps down the bulk (see Figure 13). Rope can be fastened to the eye of an insulator in the same fashion. When pulling a line through the trees, a series of gentle tugs, rather than a steady pull, usually seems to work better.

A frequently used procedure that should be mentioned is that of throwing a weighted line over the wire (or sometimes rope) as described in Reference B, to get around an obstructing tree or branch.

Although not a word has been written here that you don't already know, you've got to add

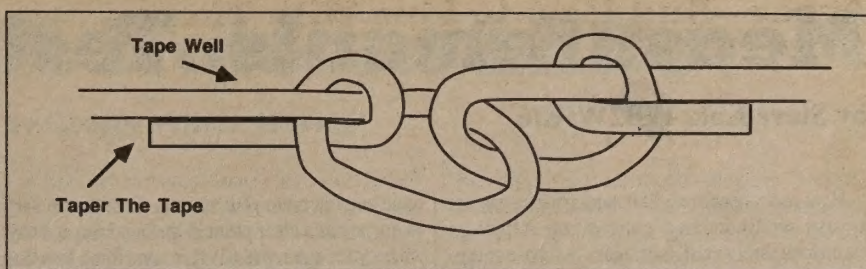


Figure 13. Tying half-hitches.

a lot of patience. If you budget an hour for a task it may take the whole day.

There is one additional tactic that might work. Sometime, when the wife is away, you might discreetly saw down an especially offending tree. But you can tell the XYL that a storm blew it away. If you have built up a reputation for veracity through the years, she will have no recourse but to believe you.

Epilogue: If someone knows of a rugged flexible saw that can be thrown over a tree branch far above the ground, I would appreciate learning how to acquire one. It would make working with trees much easier.

Anecdote: To eliminate some troublesome

upper branches, I climbed to the top of an extension ladder placed against a tree and sawed off the top of the tree with a handsaw. As the top toppled, I suddenly realized that the ladder had toppled as well, and I was suddenly 20 feet in the air without support. In desperation I wrapped both arms tightly around the tree and slid to the ground, losing lots of skin, blood and dignity. As a consequence, my present rules for a similar situation are: 1. Secure the top of the ladder firmly to the tree; 2. Wear a parachute; 3. Keep one foot firmly on the ground. **RF**

References:

- A. ARRL Handbook
- B. ARRL Antenna Book

RF review

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Fax (612) 452-4571
Price Class: \$169

The DSP-9 Audio Noise Reduction Filter

by Jim McLelland WA6QBU

Some time ago I read several articles about a new type of filtering system called DSP or Digital Signal Processing. Impulse noise reduction, multiple heterodyne notching, and variable bandwidth all at the same time sounded too good to be true and since it was way too expensive for me (approaching \$1K), I dismissed the whole thing by concluding that it probably didn't work anyway. Then came Timewave's DSP-9 advertisement, with the unit priced within my range. Now that was more like it, and it seemed to have all of the above-mentioned features that I was interested in. Being the suspicious type, I called Timewave to make sure it really did everything they said it did. After a friendly chat, I couldn't stand it any longer so I ordered the thing. Read on for the details, but one word of warning: If you go any further, you

might as well get out your wallet now because believe me, you're going to want one.

Digital Signal Processing

Digital Signal Processing, or DSP for short, has several steps to it. The audio signal is first digitized with an analog-digital converter. Then a clever processing technique that recognizes speech patterns allows only signals that match what it expects to see to pass through. This gets rid of all kinds of QRM and QRN. In addition, it can zero in on multiple heterodynes and notch them out. This takes the squeaks and squeals out of trying to work close to BC stations on 40 meters. Also, it has a selectable bandpass that has vertical skirts. If there's a signal right next to you, narrowing the bandwidth down a

bit gets rid of the monkey chatter and really cleans the signal up. All three filters together can literally make signals jump out of the noise. After all that is accomplished, a digital-analog converter turns the signal back into audio and amplifies it. Sounds pretty slick, doesn't it?

Product Description

The DSP-9 is a little 6" x 6" x 1-3/4" box. It operates on 12 VDC, with power, input, and output connectors on the back. The front panel has a volume control, headphone jack, six function push-buttons, and two LEDs to indicate proper input level. The functions include six bandpass choices, a random noise filter, a multiple notch filter, a phone/CW selector, and a bypass switch. By selecting phone or CW, the filter bandwidth choices are as follows:

Phone	CW
3.1 kHz (-60 dB)	500 Hz (-60 dB)
2.4 kHz (at 180 Hz)	200 Hz (at 50 Hz)
1.8 kHz (outside B.P.)	100 Hz (outside B.P.)

The front panel layout is very easy to use and the equipment seems quite self-explanatory. For the more conservative ops, it also comes with a very complete 10-page instruction manual. Personally, I always like to read those later because I'm always in too much of a hurry to try things out.

Installation

Hookup is a snap (no pun intended). Audio

input and output cables use RCA phono jacks. One connects to a speaker and one to the rig's output. A third cable is needed for the 12 VDC power, and the manufacturer even provides you with the connector for this. That's all there is to it! Now for the good part.

Field Test

Testing the DSP-9 is nothing less than spectacular. I have literally had voices appear out of the noise on 40 meters (the XYL says I've been hearing voices for years). I usually start by selecting the bandpass that gives me the most readable signal. Then, if there are any heterodynes left, I hit the automatic notch filter and they disappear instantly and totally. Lastly, if there's any noise, and there usually is on 40 meters, I turn on the noise filter. I've had it completely eliminate an S-9 noise level. By that, I mean that with the rig's noise blanker turned off, I could still see the S-9 noise on the meter but I couldn't hear it anymore. It was just incredible. Now, if the other ops could only hear me!

Conclusion

You gotta get one of these things! If everyone used DSP, we wouldn't need all those KW Linears so often on 40 meters, or anywhere else for that matter. Maybe we could even set up a little piece of 40 for low power. What a novel thought. **RF**



Measurements, Tests and Marketing

by Steve Katz WB2WIK/6

Ham radio operators, like most people, are not always well-educated consumers. Although exceptions surely exist, most hams purchase equipment, antennas, and so forth based on published "ratings," most of which are disclaimed as "subject to change without notice" and are based on very little data derived from any reasonable statistical process controls. Haven't you been influenced toward some purchase by "specification sheets"? Sure you have; I think we all have.

Unfortunately, specification sheets don't always tell you very much. Much of the data could be prejudiced, since it's published by manufacturers who have no reason to point out shortcomings in their products. If a piece of equipment doesn't perform particularly well under certain conditions, this "data" is often conveniently omitted from published specifications. And even if all the published data is absolutely true (probably a rare circumstance), how meaningful is it in real-world conditions?

Don't Fall for Data

Lots of examples exist to demonstrate how useless published data can sometimes be. Here's one example that comes to mind:

Manufacturer A sells a 2 meter "brick" power amplifier, rated for 170 watts output when driven with a 30 watt signal. This product also contains a "low-noise GaAsFET (Gallium-Arsenide Field Effect Transistor) preamplifier," to presumably help pull in the weak ones. The receive preamp's claimed gain is 20 dB and its claimed noise figure is "under 1 dB." What the "spec sheet" doesn't tell you may be more important than what it does.

Anyone with a high-quality RF wattmeter, a suitable exciter, power supply and "dummy load" can test the transmitting power amplifier. A suitable wattmeter might be a Bird Electronics Model 43, with a "250C" plug-in element. This meter will be accurate to within 12.5 watts (5% of "full scale") in measuring RF power in a 50 ohm system. Key up the exciter and amp, and—Bingo! There it is, 170 watts RF output power. No problem. The manufacturer told the truth—this is really a 170 watt amplifier. But now run some other tests to see how useful this product might be in your station. First, with a suitable, high-quality dummy load still connected, leave the system "key down" for 10 minutes. At the end of 10 minutes (not an unreasonable time period for long-winded amateurs!), how much output power is there now? Is it still 170 watts? Did the amplifier trip its "thermal protection" circuit and shut off altogether? Take notes.

Now disconnect the dummy load and try the

same amplifier into your antenna. Tune the exciter's frequency to a clear point in the band (no activity) where your antenna's SWR is something less than perfect. You can check this by monitoring reflected, rather than forward, power. Every 2 meter antenna will rise in SWR at some point—no antenna is perfect across the entire 4 MHz. When you arrive at a frequency where your SWR is "worst case," it may be 1.5:1 or even a bit higher, even though the match may be "perfect" at some other point. At this "worst case" point, measure forward power. Is it still 170 watts, or something less? If it's less, take an actual SWR reading. What is it? Write this down, too.

When I ran this test on a few products rated about the same as the "Manufacturer A" item described, every one either sagged in output power to less than 150 watts, or shut itself down. Not one actually maintained 170 watts output power for 10 minutes. Then, when measuring output power with an antenna connected having an SWR greater than 1.5:1, I found the amplifiers dropped significantly in output power; typically, the output decreases about 10% for each SWR point above 1.5:1. For example, with an SWR = 1.6, output power was 153 watts; with SWR = 1.7, output was 138 watts; at SWR = 1.8, output was 124 watts; and so forth. Since I know of no 2 meter antenna that is flat across the entire band, this is "real world" conditions. Is this "truth in advertising?" You decide.

Preamps

Now, how about that receive preamp? Anyone with a high-quality signal generator and either an RF millivoltmeter or an RF microwattmeter (neither of which is expensive surplus—check the swap meets) can measure preamp gain. I did, and sure enough, 20 dB was conservative. Some of these preamps have 22-25 dB gain. I found one with 30 dB gain! Zowie! But gain is not the important factor in receive preamps installed between antennas and an already sensitive front end, as normally exists in our radios. In fact, most modern VHF two-way radios, including our modestly-priced amateur rigs, have plenty of sensitivity to begin with and surely don't need a preamp. A preamplifier will only help reception under the following conditions:

1. The preamp's noise figure must be lower than that of the existing receiver;
2. The preamp must have sufficient gain to overcome the following stage's internally-generated noise (i.e., noise figure);
3. The existing receiver's noise figure must be higher than the ambient noise level (atmospheric, solar, etc.) with the normal station antenna connected;
4. The preamp must not have so much gain that

it overloads the existing receiver under normal signal conditions, thus degrading receiver performance.

Testing

How do the preamps in the popular VHF "brick" amplifiers meet these criteria? Very poorly. Although making noise figure measurements in the field is cumbersome, and most amateurs lack proper instrumentation to do so, anyone can perform this useful test: Connect your antenna directly to your rig, with the brick and its preamp out of the line (that is, completely disconnected—not just in line with the preamp switch turned off). Tune in a very weak but stable (not fading) distant repeater, one you can barely hear at all, preferably one which doesn't even move your S-meter. Listen to it for a minute to confirm that the repeater's signal is not varying up and down in strength, but is so weak you can barely understand what anyone is saying. Now, connect the brick in line using a coaxial patch cable, and turn its preamp on. Ignore your S-meter. Just listen to the same signal. Does it sound any better? Can you clearly understand everyone now, or are they still barely understandable?

If the signal sounds about the same, regardless of S-meter reading, you haven't improved a darn thing. Thus, the preamp is worthless for your particular radio and antenna system. How often is this the case? Almost always. The preamp's gain will make your S-meter read substantially higher—with a weak signal maybe going from "S1" to "S9-plus" or something—but that is only an indication of more voltage in your IF and has absolutely nothing to do with sensitivity. Is the "low-noise" in this amplifier worth the additional money it costs you? You decide.

In many cases I've seen, the preamps in these amplifiers actually degrade receiver performance because they have way too much wideband gain. A typical "GaAsFET" preamp which is noise-optimized in a 50 ohm system can have more than one octave bandwidth. That is, a 2 meter preamp might amplify signals from 72 to 216 MHz with nearly as much gain as it will at 144 MHz. Not all preamps are like this, but many are, especially inexpensive ones lacking lots of tuned circuitry. Now, between 72 and 216 MHz there are an awful lot of signals floating around: Nine television channels, the entire FM radio broadcast band, the VHF "high band" public service and marine bands, the entire 2 meter amateur band, and maybe the low end of the 222 MHz amateur band, might all be "preamplified" by your "low-noise preamp." Any single signal, or combination of signals, in this broad range of frequencies can overload your preamp or your receiver and cause intermodulation products that make it difficult to hear the stations you really want. In most populated areas, this is the rule, not the exception.

I have a little Kenwood TH-28A handie-talkie which has a wideband receiver and works quite well, especially when used with its rubber duckie antenna. If I connect a full-sized, tower-mounted 2 meter omnidirectional antenna to it, its apparent sensitivity degrades, not improves, because it becomes so overloaded by strong signals in and outside of the 2 meter band. If I use an external preamplifier ahead of it, I can't even copy strong 2 meter signals amongst all the junk the preamp brings in. A preamp with this HT is completely useless, as it will be for most "handies."

What have we learned? Do we avoid using solid-state "brick" VHF amplifiers? Not at all. I still use 'em in lots of places. I just don't ever use the preamps, and wish the manufacturers would leave them out and charge us a little less. The manufacturers have stumbled onto a marketing scheme: Add more useless stuff that doesn't cost much to include, and crazy hams will buy it. It probably started out with just one manufacturer including preamps, then the others jumped on the bandwagon to compete. It would have been smarter, in my opinion, for the others not to jump on the bandwagon, to leave the preamps out, and to truthfully advertise that the preamps are pretty worthless, anyway.

This is just one example of how "specsmanship" fools us. There are many others. Here's another case:

Receiver "A" has a specified sensitivity of 0.3 μ V for 10 dB S+N/N (signal plus noise-to-noise ratio) at 14 MHz. Receiver "B" has a specified sensitivity of 1.0 μ V under the same conditions. Which one will hear signals better? Receiver "A" will, right? Maybe. Maybe not. At a frequency as low as 14 MHz, receiver sensitivity is one of the least important criteria in evaluating performance. Sensitivity is measured in a "closed" system; that is, with the receiver connected by a shielded coaxial cable to a signal generator. Do you normally operate your rig this way? Of course not! You connect an antenna to it. At 14 MHz, the normalized (averaged hour-to-hour, day-to-day, over a long period of time like a year) atmospheric noise level is much higher than 1.0 μ V with any reasonable antenna (say, a half-wave dipole) connected. Will a receiver having a sensitivity less than 1.0 μ V serve any purpose under these conditions? No. If the ambient noise level (combination of solar noise, lightning static, power line noise, and noise from a variety of other sources) is above 1.0 μ V, it will completely mask any signals falling below that level, anyway.

HF Receiver Performance

So what are the important criteria for evaluating HF receiver performance? OK, here goes:

1. Dynamic range and avoidance of "blocking," intermodulation, cross-modulation and other by-

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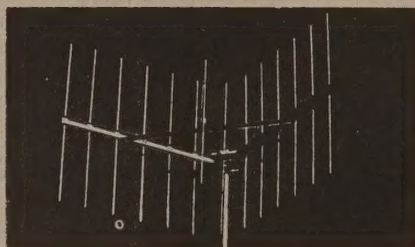
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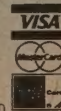
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products of overload;

2. Selectivity, the ability to discriminate the desired signal from others;

3. Freedom from images and other spurious receiver products;

4. Noise rejection, filtering and blanking;

5. AGC and audio response characteristics which make the receiver easier to listen to.

Some of these issues are rather subjective and difficult to reflect in published specifications. Here's an example of how difficult it really is to adequately describe "selectivity":

I have a Kenwood TS-850S/AT transceiver for HF. I purchased an optional "narrow SSB" filter having a rated bandwidth of 1.8 kHz, and installed it. Yep, it's "sharper" than the standard 2.7 kHz bandwidth filter. But thankfully, the TS850S/AT allows the user to install lots of extra filters without having to remove the original ones, and the filters are front-panel selectable. The "improved" 1.8 kHz filter is narrower, but not nearly as good as the standard 2.7 kHz filter in a variety of ways. When in use, it does not have as much opposite-sideband rejection as the standard 2.7 kHz unit, so if interference is coming from the opposite side of "zero beat," it actually has less rejection, not more, than the wider filter. And it has less ultimate rejection as well: This is rejection to signals very far off the desired frequency. I bought the filter, I installed it, I sometimes use it; but it did not really improve the radio in any way useful to me as an operator. I never would have known this by reading the data sheet—it takes "hands on" experience to realize what, if any, benefit is derived from this optional accessory.

What good is a "bandwidth" rating, unless you also know such things as insertion loss, shape factor, ultimate rejection and lots of other things that are not easily described? Nothing, really. What good is lots of receiver sensitivity on noisy bands? Nothing, really—again.

Transmitter output power is something we are all concerned with. There's certainly a lot of difference between 10 watts and 1,000 watts output power. But is there much difference between 100 watts and 150 watts? The difference is 1.76 dB, less than one-third of an "S" unit. Worth anything in the real world? Not usually. More important than power output is how clean is that output and how does the signal sound on the other end? From 28+ years of experience working DX, contests, scatter, satellites, moonbounce and lots of things, my conclusion is I'd rather have 100 watts of clean, wonderfully modulated, undistorted power than 1,000 watts of mushy, fuzzy, distorted signal. And this is such a subjective issue that all the spec sheets in the world won't reveal a thing about it. The best way I can think of to determine how a particular rig sounds on the air is to listen to one with your own ears, using your own receiver. Then listen to lots of others. Take notes on what rigs sound the best, and rule out the ones that don't.

The problem with many high-powered amplifiers is that they run more power than they should. Many examples exist, but I'll pick on an obsolete model made by a company no longer in the amateur business at all, so I won't hurt anyone's feelings. This is the good-old Heath SB220. The SB220 was a highly successful product, with thousands sold by Heathkit over a period of many years. It used a pair of 3-500Zs and was rated for 1,000W PEP output power on 80 through 10 meters. Did it work? You bet! No product could be so successful if it didn't have something going for it. The problem with the SB220 was it used a voltage-doubler power supply that provided about 3,000 volts DC output under "no load" conditions, and only about 2,500 VDC under "full load" conditions. That's a voltage drop of 500 volts. Where did the 500 volts go? It appeared as ripple modulation on the output waveform. If you ran an SB220 at 1,000 watts carrier (CW) output power and observe its output signal on an oscilloscope with the horizontal sweep frequency adjusted so that the 'scope displayed about 5 mS/division, you could clearly see lots and lots of AC ripple riding on the carrier. I mean lots of ripple. Ideally, there wouldn't be any at all. The higher-priced amplifiers from Henry Radio,

ETO/Alpha, et al, exhibit maybe just the slightest trace of such ripple, not enough to ever hear on the air. But the low-cost SB220 had so much ripple you could hear it on the air, in the form of a slight "buzz" or raspiness to the CW signal, or slight hum modulation on voice peaks during SSB operation. No simple cure exists. The problem was that Heathkit used a low-cost, light-duty high-voltage power supply having insufficient filtering and regulation for such high-power operation. If one reduced the SB220's drive signal so the amplifier produced only about 500 W output power, most of the problem disappeared. That is because the power supply needed to produce only half as much current, and it was capable of that without creating a great deal of ripple. But hams being hams, we tend to "push" things a bit. Many have "pushed" the SB220 to 1500 watts output power (substantially more than Heathkit ever intended), and under these conditions they sound truly awful on the air.

The SB220 designers made another classic mistake, one which users paid for many times over: They used an axial fan, rather than a centrifugal blower, to cool the 3-500Z tubes. The 3-500Z, as developed by Varian/Eimac (Salt Lake City, UT), is intended only for "bottom up" air system cooling, using a high-pressure centrifugal blower, air system sockets and glass chimneys to properly duct the air around the tube envelopes (see Note 1). An axial fan blowing across the tubes may cool them, but not sufficiently for long operating life. When SB220 owners had tubes burn out prematurely and tried to get warranty service from Eimac, they were often told, "We don't warranty tubes used in the SB220 because the air cooling system is not per our recommendations." Period. No warranty claims.

Other amplifier manufacturers have taken similar shortcuts, but I won't pick on them. They know who they are.

How can one know about such matters in advance? Looking at data and spec sheets sure won't tell you. One way to tell about potential ripple problems is to try the amplifier out before you buy it, and observe how much the power supply voltage drops from "no load" to "full load" (full power, key down) conditions. If it drops more than a few percent, be suspicious. My Henry Radio 3k Premier amplifier, for example, has a power supply delivering 3,800V "key up" and 3,600V "key down," running 1,500W output power. This is 200/3,800V, or a 5% drop. Satisfactory for a good, strong, pure-sounding signal that won't be modulated by hum and ripple. (Note the SB220 drop was normally about 17%—way too much.)

In my opinion, if you want to know which antennas work best, ask the guys who are winning the contests. Be it HF, VHF, UHF or whatever, the big-gun contesters have usually found what really works best and that's what they're using. Good antennas help them win. But if you take this route, be sure to ask only U.S.-based big-gun contesters. Anyone can run up a big score using even mediocre antennas if they operate well, from a rare island. Funny thing about rare DX locations: They tend to add about 30 dB to your signal strength.

My intention here is to raise the consciousness level of every reader, so he or she can be a more educated consumer. How equipment works is far more important than how it is specified to work. Simple tests can be run at home, even without sophisticated test gear, to determine the worthiness of almost any equipment you have or are considering adding to your station. Such evaluations should take precedence over published specifications! It doesn't matter how sensitive a receiver is, if it overloads the moment you connect your antenna to it. It matters not how much power output a transmitter or amplifier has if it doesn't sound good on the air. And the world's best antenna isn't worth anything to you if it doesn't work better than what you already have. Be an educated consumer, and you'll have a better station for less money invested than others who aren't as wise.

RF

Note 1. The Drake L4B, Henry 2K and others manufactured during this same period did use the proper cooling method for these tubes.

A Note on LEDs

by George Wilson W1OLP

LEDs are the most-used electronic indicators. They are inexpensive and easy to use. With liquid crystal and fluorescent displays, they have all but replaced meters. They are used in watches/clocks, cameras, radios, and many other devices.

LEDs are compatible with solid-state circuitry because they operate at low voltage and current. Special low-current LEDs (about 2 mA) are available for circuits that need low-power consumption. Extra-bright, blinking and multiple-color LEDs are also available. The most used LEDs come in red, yellow and green, and require about 2 volts and about 20 mA. They can be operated on either DC or

AC; since they are diodes they are "self-rectifiers." Use about 4 volts RMS to operate them on AC. The dropping resistor (R) can be easily calculated using Ohms Law when the supply voltage (V) is known: $R = (V-2)/0.02$. The drawing above the graph in Figure 1 shows the polarity of a typical LED. If you connect one in reversed polarity it will not light. When AC is used there is no polarity to be observed.

The LEDs' brightness is controlled by the current flowing through them. The graph in Figure 1 is typical of the popular 2V/20 mA type of LED: Less current makes them dim; more current makes them bright; and too much current shortens their life.

RF

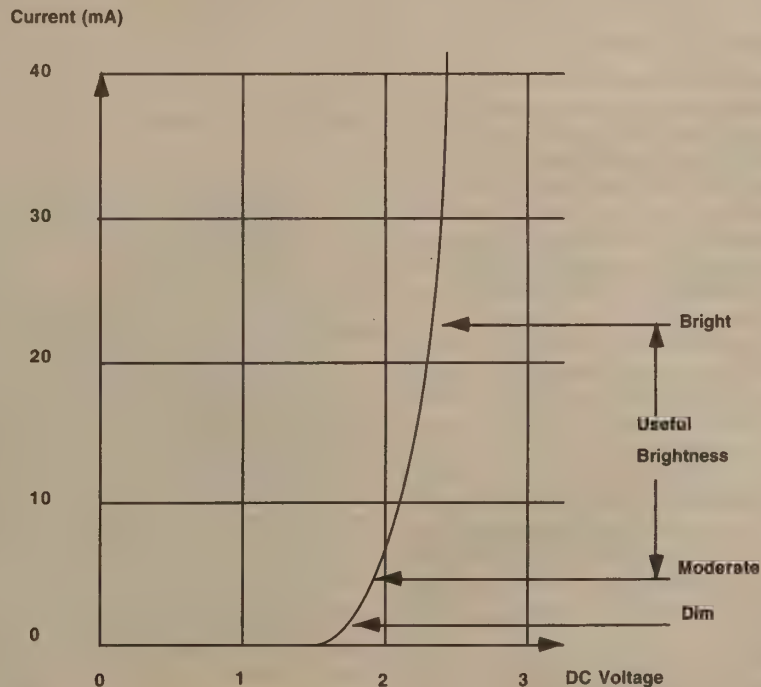
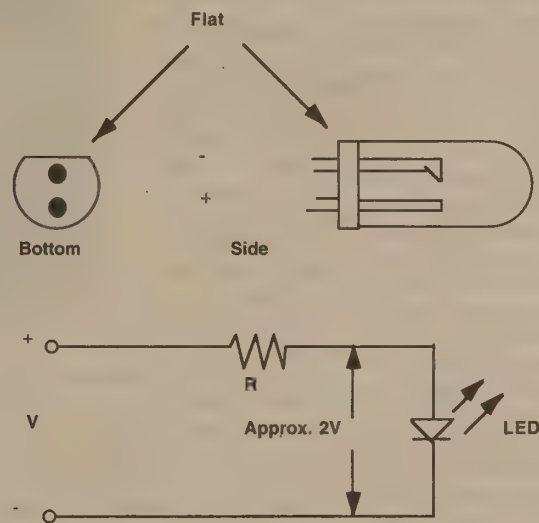


Figure 1. Typical LED characteristics.

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The Kenwood TM-621A

by Paul Grupp KA1LR

144/220 MHz FM Dual-Band Transceiver

Throughout the late '70s and the early '80s, most hams who operated mobile did so on a single band: 2 meters. Now, in many metropolitan areas, 2 meters has become so crowded that normal QSOs are nearly impossible. This crowding has forced increasing numbers of us to migrate to 440 MHz, and most recently, 220 MHz. With the notable exceptions of NYC and LA, these bands are relatively uncrowded throughout the country. You can listen to a repeater for hours without hearing a "kerchunk," and the term "QSO" still refers to a conversation between individuals, rather than a round table with a cast of thousands.

For several years now Kenwood, ICOM and Yaesu have made dual-band transceivers which cover the 2 meter and 440 MHz bands. But, if you wanted to have 2 meters and 220 MHz in your mobile installation, you had to install two separate rigs. With the introduction of the new Kenwood TM-621A this is no longer the case. Now 220 MHz fans can have their cake and eat it, too! The TM-621A is identical in features and packaging to the 144/440 MHz Kenwood TM-721A.

Features and Controls

With the power turned off, a casual observer might conclude that the TM-621A is just another compact 2 meter transceiver. Turn it on and the dual frequency displays light up, suggesting that something more interesting might be going on here. The TM-621A is a dual-band radio in the sense that it can receive on two frequencies simultaneously, and a variety of unique controls and displays are provided to support this type of operation.

The frequency display on the left is referred to as the "main display," and the slightly smaller one on the right is referred to as the "sub display." Either band can be monitored on either display, although you can't monitor the same band on both displays. The sub display functions as a dumb monitor receiver. It can monitor the VFO or memory frequency of your choice, but that's about it. All transmitting is done from the main display, and the various scanning features are active here. Each display has a separate S-meter.

Obviously, useful monitoring of two bands simultaneously requires some special controls, and Kenwood has provided them. Each display has its own VFO knob, used either to tune up and down the band, or to select a memory. The MAIN SQUELCH is located concentric with the volume control, while the SUB SQUELCH is a sliding control located near the bottom of the front panel.

The BALANCE control adjusts the relative audio level of the main and sub receivers (the receiver audio is mixed internally before it is sent to the single internal speaker or rear panel audio output jack). The MUTE switch drops the audio level of the sub receiver by about 20 dB, allowing you to give your attention to the main re-

ceiver without disturbing the setting of the BALANCE control.

Pressing the DUAL switch deactivates the sub receiver, causing the TM-621A to function like a conventional single-band transceiver. This is useful for public service or emergency operation where you are only interested in one band.

The BAND switch exchanges the frequencies in the main and sub displays. The ABC (automatic band change) switch activates an entertaining mode which performs the same function whenever a signal is received on the sub display frequency. This first appears to be a mere gimmick, but it is actually quite useful. Suppose, for example, you are waiting for a friend to call you on the sub display frequency. Without ABC, you'd have to switch bands manually to answer a call, since the rig can't transmit on the sub frequency. The ABC considerably handles the job for you.

Because the two receivers are truly independent, full duplex operation (on separate bands) is possible. You don't have to do anything special to use this feature; just grab the mike and start transmitting—the sub receiver remains active. On simplex frequencies, or in an area with linked 2 meter and 220 MHz repeaters, full-duplex operation can be quite an enjoyable experience.

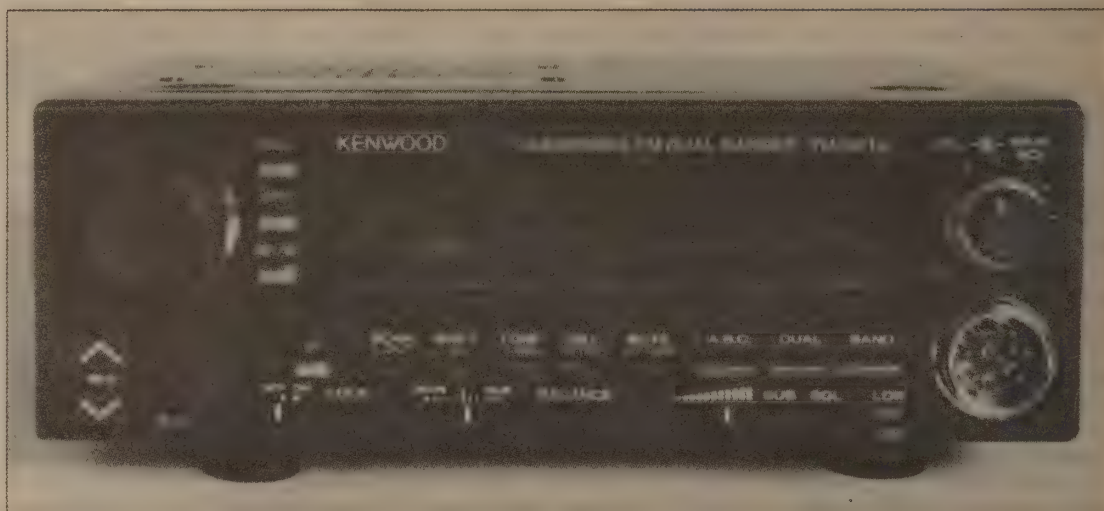
That completes our tour of the controls and features relating to dual-band operation. The rest of the controls are comparable to those found on any other full-featured transceiver. Describing them here in detail would require several pages. Suffice it to say that nearly every conceivable feature is provided for, including scanning, automatic offset selection according to the ARRL band plan, and CTCSS encode and decode (with an optional accessory).

Connections and Accessories

The TM-621 has the same eight-pin mike connector found on every Kenwood radio produced in recent years, so any mike or TNC cables wired for Kenwood gear will work here without modification. The MC-48B DTMF microphone is furnished as standard equipment.

As with many other compact radios, all connections to the rear panel (with the exception of external speakers) are made via pigtail leads. The large heat sink fins simply do not allow room for conventional antenna and power connectors.

Tantalizingly, there is a knockout on the rear panel for a third antenna connector, and unused space and mounting holes inside the rig for another power amp board. One might speculate that some future version of a triband radio is planned for the same chassis. But bear in mind that this



would require a complete redesign of the rest of the radio's boards, since there is absolutely no way that they could be easily modified for this application.

There are separate antenna connections for 2 meters and 220 MHz, which means that you'll either have to use separate antennas for each band, or attach an accessory duplexer and dual-band antenna. At press time, no manufacturers were offering duplexers or dual-band antennas for 144/220 MHz.

In general, the manual provided with the TM-621A was well-written and complete. However, I was dismayed to note that the adjustment instructions Kenwood usually provides for low power output, mike gain, beeper level, etc. were absent. I hope this doesn't reflect a trend!

Circuit Configuration

The TM-621A offers generous out-of-band frequency coverage (receive-only as shipped from Kenwood). It covers from 138 to 173.995 MHz, and from 215 to 229.980. This extended coverage is useful for monitoring a variety of public service transmissions, including NOAA weather at around 162 MHz. Power output is rated at 45 watts on 2 meters, and 25 watts out on 220 MHz.

You might naturally wonder if performance compromises were necessary to obtain dual-band operation in such a small package. An examination of the schematics and block diagrams provided with the TM-621A quickly puts those fears to rest. From an RF point of view, there are in fact two separate transceivers inside the single box. On the receive side, each band has its own bandpass filters, RF amps, mixers, and IF stages. On the transmit side, each band has separate PLL, VCO, drive, PA, antenna switch, and low-pass filter circuits. The only shared circuitry is in non-critical areas like microprocessor control and audio amplification. Because Kenwood was free to design separate RF sections for each band, there is no reason to believe that any compromises were made. Indeed, the performance specifications (shown in Table 1) bear this out. The specs are as good as (and in some cases, better than) specs from Kenwood's much larger single-band radios.

In Use

For several months now the TM-621A has been installed in the headliner of my 1976 Ford van. Separate 5/8-wave Larsen antennas are mounted about six feet apart on the roof. I have never experienced problems with desense or squelch breaking when transmitting on one band while listening to the other.

Surprisingly, the mounting bracket is simply attached to the radio with four screws. This isn't a problem for permanent in-dash installations, but when the radio is mounted under a dash, the slip-in locking bracket that Kenwood provides with many of its other mobile transceivers would be a better choice. It would allow the radio to be more easily removed for security.

The amber display was readable under all conditions—even bright sunlight. The front panel controls are reasonably well-lighted, which is fortunate. I counted no less than 22 switches and controls, none of which are mounted in a straight line across the front panel. Unless you are very talented, operating this radio by touch alone is not something that will come easily. After a few days of use, I was able to operate frequently-accessed controls like the BAND, AMC, VFO and MR/M switches by touch. Even after several months of use, I find it necessary to look at the front panel to operate controls like SHIFT, SCAN, and MUTE.

In my noisy van, audio performance from the tiny internal speaker was inadequate. Connecting two external 5-1/4" speakers solved the problem, providing more than enough punchy, intelligible audio under any conditions.

Basic RF performance was superb. I made no attempt to confirm the manufacturer's claimed specifications, but I did carefully examine real-world performance. I compared the 2 meter section to the ICOM IC-28H, and the 220 MHz section to the Kenwood TM-3530A. In all cases, the TM-621A matched or out-performed the specific units in my possession.

I often commute along a stretch of highway that is bombarded with severe leakage from the cable TV service that runs parallel to the road. Several radios I have owned or borrowed suffer ill effects, including desense and squelch breaking. The TM-621A completely ignored the prob-

lem. I noticed similar improvements in intermod rejection during my frequent visits to the RF-laden cities of Boston and Cambridge.

Out-of-band receiver performance was excellent. I frequently listen to NOAA weather broadcasts, and the TM-621A is significantly more sensitive than earlier generation extended coverage radios.

Conclusions

If you have any interest in 220 MHz, the TM-621A deserves your attention. It is an ideal radio for Novices; you can operate 220 MHz now, and when you upgrade you can immediately begin using 2 meters without buying yet another

radio. Hams with higher class tickets will appreciate the full duplex capabilities and the many features designed to make it easier to use two bands simultaneously.

The TM-621A is not inexpensive, and with a little shopping around you might be able to find separate 2 meter and 220 MHz rigs that together are slightly less expensive. But you'd be missing the many useful features that make a dual-band radio a much more convenient choice. Unless you buy radios by the pound, and like the idea of having two microphones constantly getting tangled up together, the TM-621A's superb performance, unique features and compact size make it a radio worthy of serious consideration.

RF

Reprinted from 73 Amateur Radio, April 1989.

Table 1. Manufacturer's Specifications

Dimensions	(W x H x D) 5.9" x 2" x 8.6" (150 x 50 x 219mm.)
Weight	3.97 lbs. (1.8 kg.)
Power requirements	13.8 VDC +/- 15%, <9.5A TX, >0.6A RX
Receiver circuitry	Dual-conversion superhet
Sensitivity (12 dB SINAD)	144 MHz: less than 0.2 μ V 220 MHz: less than 0.18 μ V
Selectivity	-6 dB: more than 12 kHz -60 dB: more than 24 kHz
Spurious response	Better than 60 dB
Audio output	More than 2W into 8 ohms (5% distortion)
RF output power	144 MHz: 45 watts 220 MHz: 25 watts

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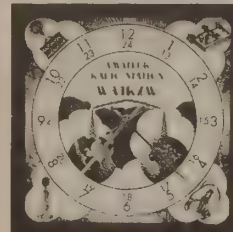
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The Kenwood TH-25AT

by Michael Jay Geier KB1UM

Pico-Sized, Mega-Featured

Once I owned two 2 meter handhelds. The big one had the features, and the small one was, well, small. I vowed I would sell them only if somebody came out with a full-featured programmable unit as small as my little thumb-wheel set. With the arrival of the TH-25AT, I made good my vow. I sold the two rigs, and bought the new Kenwood.

It's a Honey

It has most of the features of my old big rig, yet it's nearly as small as the TH-21AT it replaced. Since today's handhelds have similar features, I won't expound on the joy of having memories, an LCD, and so on. Instead, I will discuss the specifics, both good and bad, which set this radio apart.

This rig has a rugged, solid feel, something I missed in the TH-21AT. It fits in my hand as if it belonged there, and it doesn't go "squish"

if I squeeze it. The back is a metal alloy (and heat sink for RF output, as in most new units), and the front is thick plastic. The ad claims the case is water resistant and, in fact, I have used the radio in a drizzle with no ill effects or signs of water penetration. The antenna is fat and substantial-looking, but very flexible.

Power Features

The LCD, mounted on top, is great for checking the frequency when the radio is in my shirt pocket. There's a lock switch to prevent accidental frequency changes, and two green LEDs light up the display at the push of a button. (Finally, no more incandescent bulbs!) The LEDs are surprisingly bright, making the display easy to read in the dark. A second push of the button shuts off the lights, or they will turn off by themselves after about five seconds. The LCD has a bar graph S-meter which also functions as a battery voltage indicator during transmit. This is a very nice touch, and far more useful than the usual RF output indicator.

A 600 mAh NiCd battery comes with the TH-25AT. With average use, it lasts a long time. A range of batteries is available, offering increased operating time or higher RF power output. With the optional AA battery case, an especially nice feature, I can always count on a spare battery.

The automatic battery-saver circuit further extends battery life. When there is no activity or key press for more than 10 seconds, the radio "goes to sleep." Every second, it wakes up for 200 milliseconds to check for a signal. I was bothered at first by the thought that I couldn't turn this feature off, but after using the radio a while, I can see it causes no problems. The most I ever miss is the first letter or two of a callsign. The battery lasts for days when I monitor a relatively quiet repeater.

As if that weren't enough, there's also an automatic power-off circuit which shuts off the rig after 59 minutes of inactivity. It also can't be defeated, and I expected to dislike this feature, too; but in practice it works out fine. The rig beeps to warn me of power down, and any key press will reset the timer.

Frequencies and Memories

In keeping with the overall sturdiness of the radio, the DTMF pad has resilient rubber keys. You can hear the tones while you send them. The pad is only for DTMF. You cannot enter frequencies or otherwise control the rig with it.

The unit receives from 141.000 to 162.995 MHz, which means you can listen to some public service channels, such as NOAA weather. (Yes, you can make it transmit out of band. No, I won't tell you how.) There are 14 memories, four more than most units have. Each memory holds frequency, offset (+, - or simplex), CTCSS frequency and status (with optional CTCSS unit), and even the status of the "re-

verse" switch! The rig automatically selects standard offsets according to the ARRL band plan, but you can override it, of course. The last two memories can hold odd splits, but you must know the input and output frequencies, since you can't enter an offset directly.

Frequencies, memories, and CTCSS tones are selected via the top-mounted rotary switch, in conjunction with the MHz, VFO, MR (memory recall), and CTCSS buttons. In VFO mode, pressing the MHz button causes the rotary switch to step the VFO 1 MHz per click. Pressing it again returns the VFO to 5 kHz steps. It would have been nice if 100 kHz steps were also available, to avoid the monotonous (not to mention component-wearing) twirling of the rotary switch. Other radios using rotary switches work the same way.

In memory mode, the rotary switch steps back and forth through the memory channels. It's easier to do this with a knob than with buttons on a keypad. One very nice feature is the ability to copy the frequency from any memory to the VFO. Since frequency entry is somewhat inconvenient, this can really save time and effort when you want to set the VFO to a frequency near one already in memory.

During CTCSS entry, the rotary switch steps up and down through the CTCSS tones, with each tone's frequency displayed on the LCD. It couldn't be easier. Of course, the optional CTCSS unit is required for this to work.

Scanning and Memory Lockout

Limited memory and band scan functions are provided. When a signal is detected, the scanner pauses for a few seconds, then resumes scanning. There are no other choices. It would be handy to be able to set limits. Some compensation is provided by the radio's ability to scan in either direction. A twist of the rotary switch lets you change scan direction at will, so, if you watch the LCD, you can change direction when the frequency goes out of the ham band, and scan back through it.

Memory lockout is available and easy to do. When scanning memories, for example, I lock out the weather channel to avoid the rig's stopping there each scan; that's what lockout is for. Unfortunately, it is also locked out of manual selection, so that I must unlock it before I can listen to it again! Again, other rotary-controlled rigs work the same way.

TH-25AT on the Road

Walkies, of course, are not intended to be mobile rigs, but many hams use them that way to avoid the cost of yet another radio. Although some full-sized walkies aren't bad for this purpose, the TH-25AT is difficult to operate while driving. Many functions, from memory entry to DTMF dialing, are impossible to do with one hand. Plus, that top-mounted LCD, so great for shirt-pocket use, can't be seen when the

radio is lying flat. Oh well, I guess you can't have it all.

Nit-Picks

The TH-25AT is great, but what can't be improved upon? The track into which the battery slides is plastic, unlike the metal ones used by other manufacturers. It allows the battery to wobble a little, and mars the rig's otherwise rock-solid feel. Mine also shows some shedding of the plastic after a few months, which could eventually loosen up the pack enough to lead to intermittent powering of the rig from the pack. Finally, the slight movements of the AA cell pack cause crackles in the receiver, indicating poor contacts. (It doesn't happen with the NiCd pack.)

Like other small handhelds, the audio amp is puny and so is the speaker. The amp seems to clip at an even lower volume level than my TH-21AT did. In noisy environments, it can be hard to hear the rig.

Although the transmitter will produce 5 watts with 13.8 volts applied, there is no DC input jack. You must buy an adapter which slides on in place of the battery.

There is no priority alert function. It was nice with the old rig to be able to monitor two frequencies at once while waiting for a friend to call.

Although sturdy and well-protected, the PTT switch is hard to press, and makes my finger hurt after only a short while. Also, there's a fairly strong birdie in the receiver from 156.190-156.200, which will pause the scan. I checked with some friends in other states, and theirs had it, too. It is, however, well out of the ham band, and thus not too important.

If the CTCSS receiving function is on and the received signal is not sending CTCSS, the scan will pause even though the audio will remain squelched. Why? Also, it's impossible to set the transceiver to receive CTCSS without also being set to send it.

The S-meter display has 10 small segments and one big one, suggesting an 11-step display. But the small ones always come on in groups of two, so it's really a six-step display. This is also true of the battery voltage indication, so its resolution is rather limited. Finally, varying S-meter readings cause soft clicks in the receiver, especially on weak signals.

Calling All Manufacturers

Which brings up my final suggestion to all ham radio manufacturers: Put the lithium batteries in holders, so that we ourselves can change them! Why make us send the radios in for repair every five years just to replace a battery?

Conclusion

Even including these minor grievances, this is the best walkie I've ever owned. It feels good and works well, and keeps useless features to a minimum. It does nearly everything I'd want my "dream rig" to do, and it's small enough to take anywhere. I intend to keep it for a long time!

Reprinted from 73 Amateur Radio, April 1989.



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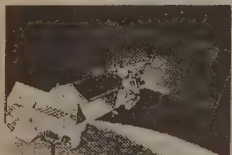
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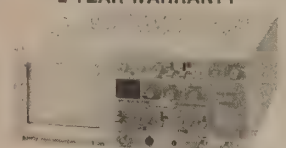
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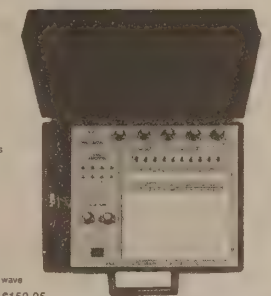
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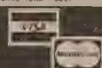


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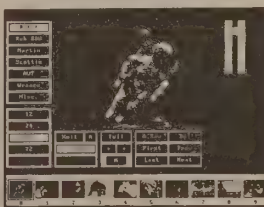


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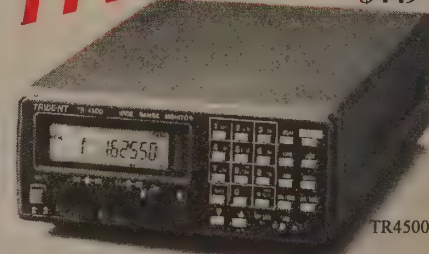


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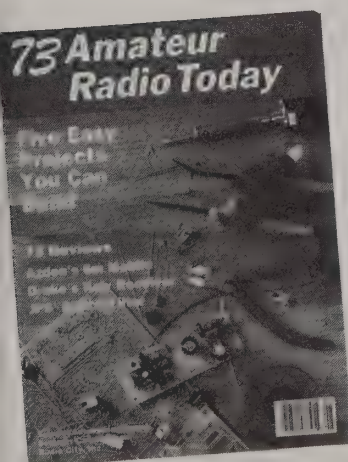
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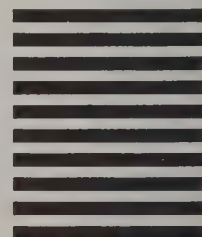
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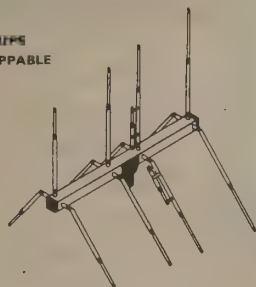


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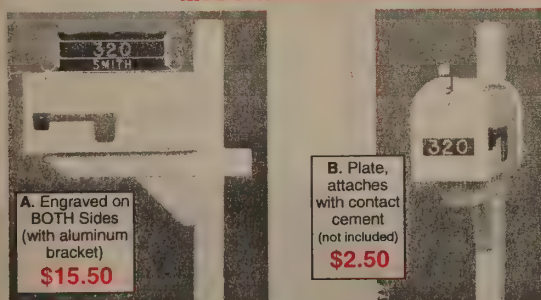
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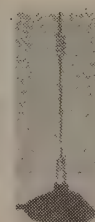
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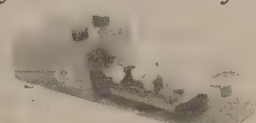
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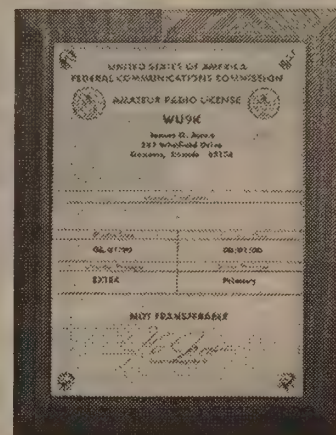
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The Bent X Antenna for 80 and 40 Meters

by Bill Clarke WA4BLC

The 80 and 40 meter bands are heavily used and carry a consistently large amount of the amateur activity in the United States. Literally hundreds of local and regional nets operate regularly on each band using phone and/or CW. These bands have become even more popular due to the poor propagation characteristics during the current low of the sunspot cycle.

The mainstay for operation on 40 and 80 meters is the simple dipole antenna. Most are not very high above the ground (generally under 40 feet) and are fed with coax feedline. Unfortunately, not all hams have the space for a full-sized dipole for 80 meters, which is 120 feet long. This article is the complete instructions for constructing a single antenna that will operate on both bands, needs no tuner or antenna switch, costs under \$40, hangs between two supports only 65 feet apart, and can be built and installed in only a few hours.

How To Build It

The accompanying antenna diagrams visually explain what you will be doing when you construct this antenna and what the finished product should look like. Familiarize yourself with them before starting construction.

Step 1. Decide which portions of each band you plan to operate on. Note that you can operate on other portions of these bands by using a tuner.

Step 2. Carefully roll out the antenna wire (do not allow any kinks) and cut the leg lengths as follows (extra wire has been included for connections):

- 80 Meters CW: 67 feet
- 80 Meters Phone: 62 feet
- 40 Meters CW: 34 feet
- 40 Meters Phone: 32 feet

Step 3. Lay out your cut wires on the ground in a manner similar to the completed antenna shown in Figure 1.

Step 4. Thread an end insulator onto each of the 80 meter legs and position each 30.5 feet from the feed point, as shown in Figure 2.

Step 5. Attach an end insulator to each of the legs, as shown in Figure 3.

Step 6. Join the legs to the center insulator as per Figure 4.

Putting the Antenna in the Air

Installation of this antenna requires two supports a minimum of 65 feet apart with a height of 40 feet. This allows the 80 meter legs to be stretched to 30 feet each, with the remaining

length hanging straight down. The 40 meter legs form a vee beneath the 80 meter segment (Figure 1). Supports can be trees, the tops of buildings, or small push-up towers.

Using the Kevlar rope, fasten the middle insulators of the 80 meter wires to the supports and pull the antenna into the air. Attach a painted 2x4 to each 80 meter leg end insulator with a short piece of rope. *Be sure these pieces of 2x4 are high enough to prevent injury to people or pets.*

Attach rope to the 40 meter wire ends and pull them down and out, forming a vee.

NOTE: It is good practice to keep all antenna wires high enough to avoid intentional or accidental contact from ground level.

Connecting the Feedline

The single standard for feedline length is: The feedline must reach from the rig to the antenna! Don't be concerned about quarter- or half-wave electrical lengths, only use what is

necessary to reach, but do allow for some extra slack for wind movement.

I recommend RG-8X coax feedline for this antenna, as it will handle legal-limit power and is not expensive. To make the installation simple, purchase the feedline with the PL-259 (UHF cable connectors) installed. This will save time and generally cost no more than the price of parts, sometimes less.

Using the Bent X

The Bent X 80-40 antenna provides an acceptably low SWR (less than 2:1) over about 100 kHz on 80 meters and 200 kHz on 40 meters. This means you can QSY within those bounds without the need for a tuner.

Using an SWR meter, check the antenna to determine its operational frequencies (lowest SWR points). If the lowest SWR reading is at a frequency below where you want to operate, shorten each leg of the antenna (for that band only) an equal amount. If the lowest reading is at a frequency higher than that desired, you must lengthen the appropriate legs (equally on each side). Cutting or adding in increments of six inches should be satisfactory for making these adjustments. Retest after each length change is made.

Antenna Safety

Disconnect and ground this antenna, as you should all other antennas, during periods of non-use and/or when weather is capable of producing static electric discharges. **RF**

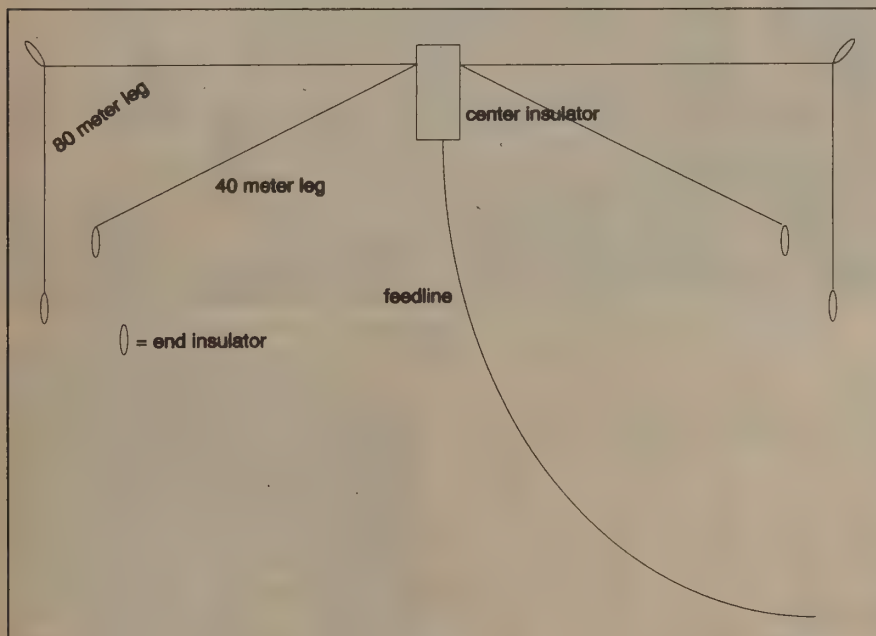


Figure 1.

Parts List for the 80-40 Antenna

#14 copper stranded hard drawn wire	200 feet
Plastic dog-bone end insulators	6
Radio Works BI center insulator	1
Kevlar (black 400# test) support rope	200-foot roll
Coax feedline	Sufficient length to reach the antenna
2 6" lengths of painted 2x4 with a screw eye installed in one end	

Most of items listed can be purchased from The Radio Works, Inc., P.O. Box 619, Portsmouth, VA 23703 (804) 484-0140, most local ham radio supply stores, or at some Radio Shack stores.

For tools, you will need a soldering gun (150-250 watt), rosin core solder, wire cutters, a large tape measure (50'), and an SWR meter.

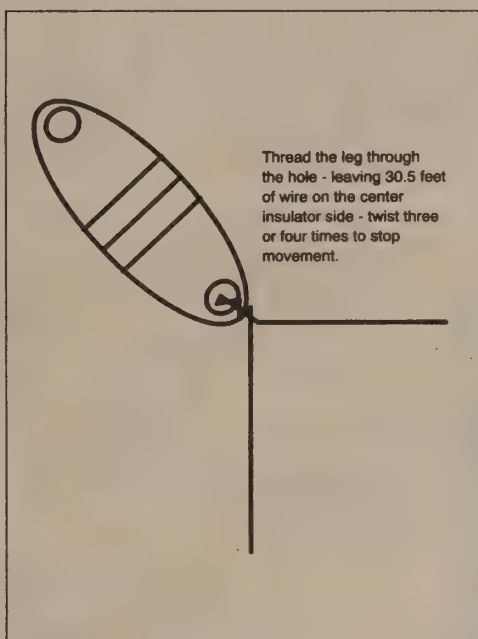


Figure 2.

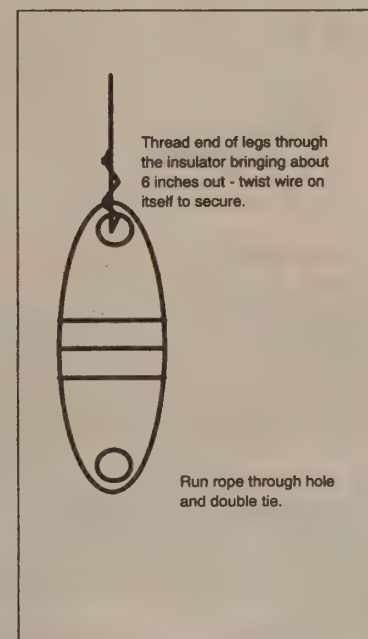


Figure 3.

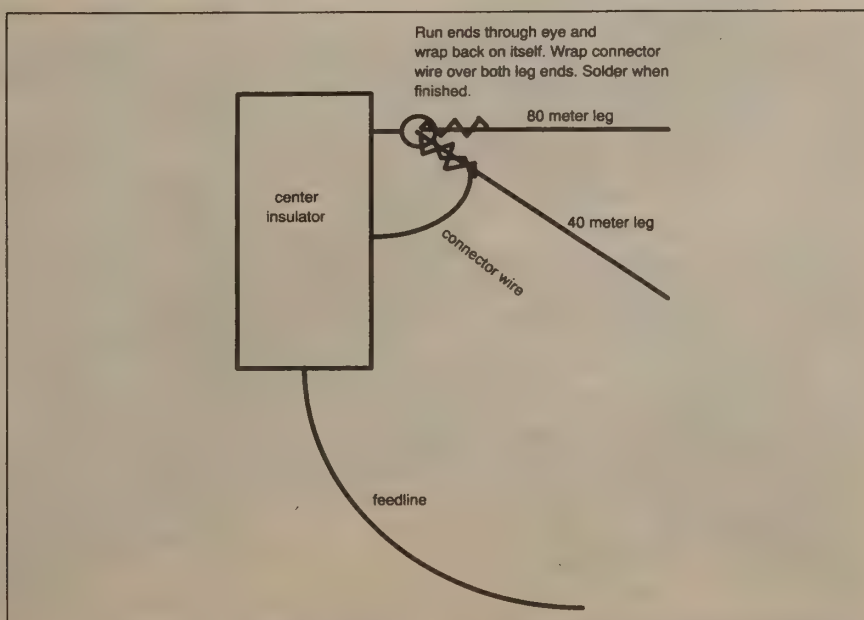
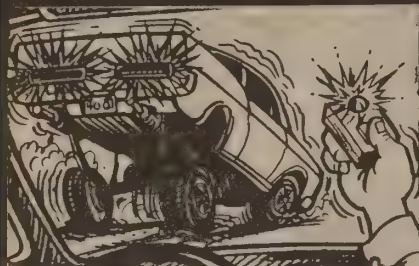


Figure 4.

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Project Enclosures

by George A. Wilson, Jr., W1OLP

One of the real deterrents to building your own equipment is the lack of suitable/affordable enclosures. It is unfortunate that one has to search the catalogs to find a container for a home-built project and then adapt the project to it. With a little effort and at minimum cost, the project box/cabinet problem will go away. The secret is to use model airplane techniques and build enclosures that will custom-fit your particular project.

A material called "liteply" is available from some lumber yards and most hobby shops. It is 1/8"-thick soft plywood that can be cut with a utility knife. A fine-toothed blade in a table saw works well also. It can be painted and made to look very professional. Fill the grain, sand it and paint it with polyurethane enamel or one of the Rustoleum paints. Use a soft brush; the surface will be smooth and shiny.

Figure 1 shows a typical construction for small cabinets. (Note: You are free to improvise on the design.) Assemble the enclosure with aliphatic resin glue (e.g., Titebond or Elmer's Carpenter's Glue). This type of glue sands easily. Use small brads or clamps (clothespins do well) to hold the parts together while the glue dries.

The panel may be metal, plastic or liteply. Single-sided printed circuit board works well. The circuit board can also be a piece of printed circuit board and it may be soldered to the panel if the circuit is relatively light.

If the circuit in your enclosure dissipates appreciable heat, open holes in the back panel and/or sides to allow for air circulation. Alternately, the back panel can be made of "perf-board." Make the back removable if you need access from the rear.

Stick-on rubber feet are useful to help make the cabinet stay put on slippery surfaces.

So, no more complaints are needed about enclosures to fit your pet project. Take tools in hand and solve the problem!

RF

Materials List

Top, sides and back 1/8" liteply
Bottom 1/2" pine, ply, etc.
Glue blocks (top) 1/2" sq. pine
Panel To suit (see text)
Attach panel with (4) No. 4 x 1/2" round or button-head wood screws.

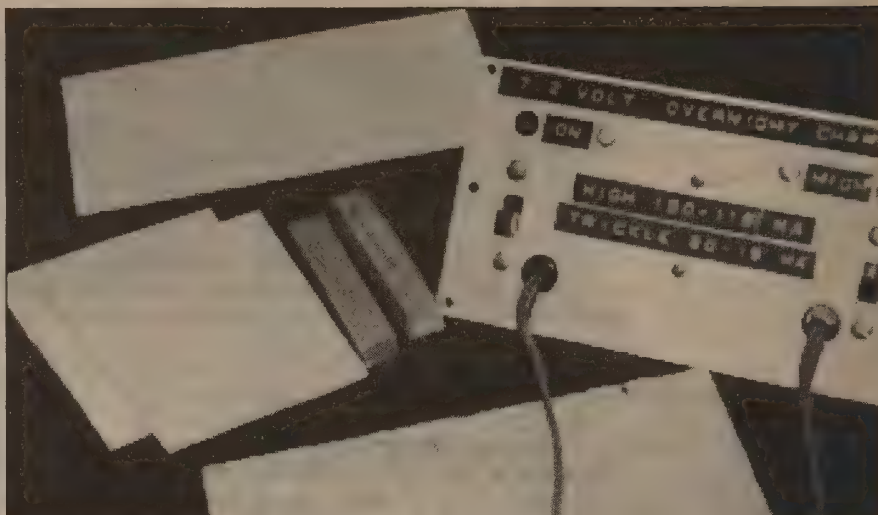


Photo A. The pieces of a project enclosure and the charger it will enclose when it is assembled.

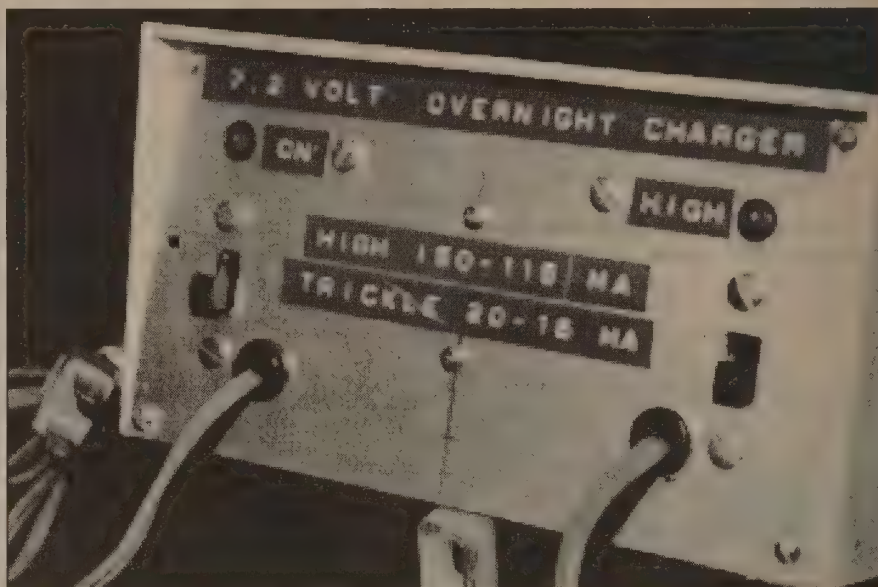


Photo B. A typical project enclosure made as described in the text. It encloses a Nickel-Cadmium battery charger.

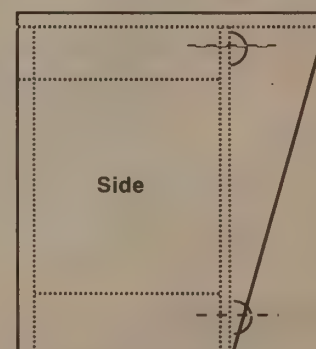
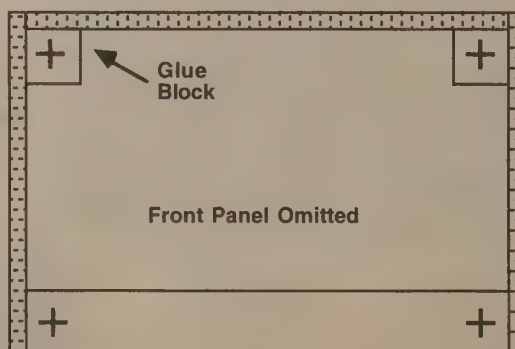


Figure 1. Project enclosure.

Low Power—High Fun

Try your hand at QRP!

by Jeff M. Gold AC4HF and Rick Cashion WD4GZW

Rick Cashion WD4GZW, Faculty Advisor for the Tennessee Technological University Amateur Radio Society (TTARS-WA4UCE), and I (Jeff Gold AC4HF, Station Trustee) were looking for something that would really catch the interest of the college students in the club. Most of the club members this year are new codeless Technicians. We wanted to get them excited enough about operating on the HF bands to make them want to upgrade their licenses. I was also very interested in demonstrating how effective low-power HF can be, even on SSB. They say "seeing is believing." In this case we hoped that operating would be believing. We decided to set up a QRP (low-power) Special Events Station in Fall Creek Falls State Park, about an hour's drive from the university. The park has many high spots with cliffs and waterfalls that offer spectacular views and good operating positions.

Preparations

We had a couple of months to plan out the details of our mini-adventure. The club funds are always on the low side so costs had to be kept down.

For the first try on a club expedition, we decided to keep it low-keyed. The information about the event was posted on the Internet (an international network of computer networks) and on 2 meter ham packet BBs. I analyzed the band conditions prior to the April 16-17 expedition. I chose what I thought were the best times for each band and advertised the event, along with QSL infor-

mation. Not long after I posted the event I received requests made through the Internet and on packet for setting up schedules for people to work the station. We had requests from as far away as New Zealand. We decided to set up a main station in the campgrounds and then operate portable from some remote sites throughout the park.

The next step was to identify the equipment that would be used during the expedition. I have an old solid-state Yaesu 301S QRP transceiver that works very well from battery power on both CW and SSB. I recently tested an MFJ 20 meter SSB rig with matching microphone. This little rig has built-in speech processing, runs for a long time on battery power and seems to really get a good signal out with low power. I have operated it at about 6-8 watts mostly and have done well both on DXing and rag-chewing. This small transceiver would be an excellent choice for this type of activity. We brought a number of fully-charged gel cells to provide power.

For antennas we brought a ZS6BKV multi-band dipole, a 20 meter dipole, a helically-wound PVC vertical for 20, 30, and 40, and the new MFJ Super HI-Q Loop. The ZS6BKV is a variation on the G5RV that has worked very well for the club during Field Day. The wire is 90' 3" long and has a 40' 450-ohm ladder matching section, then some 50-ohm RG58/U coax cable to the rig. The MFJ Super HI-Q Loop works 10 meters through 30 meters and has a semi-automatic antenna

tuner that will run off of battery power. I put a small piece of PVC pipe on the bottom side of the antenna and then pulled it up about 30 feet into a tree hanging in a vertical configuration. I also tied a guy rope on both sides to hold the antenna steady in the wind.

One of the most difficult aspects of this type of event is remembering every little cable and connector you could possibly need. There is no running to the store if something breaks or you forgot a connector. I brought a fairly complete tool set with solder, soldering iron and electrical tape. I spent hours

"One of the most difficult aspects of this type of event is remembering every little cable and connector you could possibly need. There is no running to the store if something breaks or you forgot a connector."

going through the rigs and connectors and setting up and testing the stations before we left. As a backup I have a complete QRP station set up in my car. It consists of an old Ten-Tec Argonaut 509 transceiver and an Outbacker multi-band vertical antenna set up with additional filters and a keyer and handmade paddles. I also brought some extra MFJ 20, 30, and 40 meter QRP CW transceivers for our portable operations.

Rick and I both decided to take Friday off from work and go down to the park and set up camp and the station. I went to bed early on Thursday. The day to leave finally arrived. I had checked and rechecked all the station parts and Rick had checked all the camping supplies and food. I was confident we were in pretty good shape and I set out additional reminders to all that we would be operating over the Internet on Thursday. I looked out the window as soon as I woke up and noticed the skies were almost completely black. I thought I heard some thunder in the distance. I checked the weather information. Severe

Photo D. Jeff AC4HF using an old Yaesu 301S QRP rig.

weather conditions were posted and there were warnings of tornadoes and flash flooding. The local repeater was announcing a weather alert. About an hour later we had some of the worst storms I can remember. The rain and thunder kept on coming. When the rain let up a little I drove over to Rick's house. By the time I arrived the rain was extremely heavy again. The local repeater weather emergency net was put into operation and people were dispatched to look for tornadoes. A tornado touched down to the west of town, but fortunately no damage was done. Rick and I decided to wait for a while before leaving for the park. We ended up watching two movies before the rain let up enough to depart.

We managed to make it to the park without any problems. It was only raining lightly when we set up camp. After getting the campsite operational I got out my bow and arrow and managed to get up the first rope just as the thunder, lightning and heavy rain started again. Time to call it quits for the day and hope things improved the next morning.

Continued on page 25

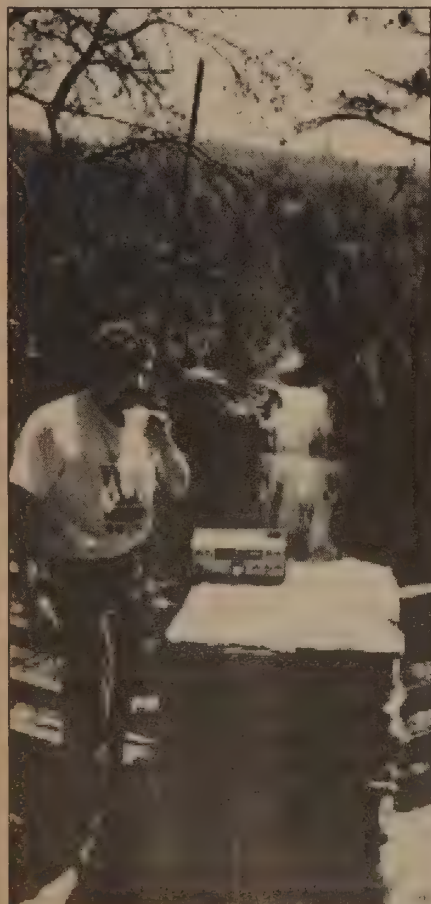


Photo A. Jeff AC4HF: Hydropower anyone? (Fall Creek Falls in the background.)



Photo B. Jeff AC4HF: "Out on a limb" using low power.



Photo C. Avery KE4ERW hard at work.

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The Last Parts?

For the past several months, we've been
exploring the various kinds of parts which
make up our equipment. At last, we're ready
to finish this topic up . . . at least I think so!
Let's get to it.

ICs

ICs, or integrated circuits, were once very
exotic things, found only in military gear and
perhaps a few extremely expensive consumer
products. These days, ICs are cheap, and you'll
find them in just about everything. As I'm
writing this on my computer, which is a box
of ICs if ever there was one, I'm looking around
at my houseful of gadgets, and I can't think
of anything that doesn't have ICs in it! OK,
not the antenna tuner. But all the rest of the
ham gear is loaded with them, as are my stereo
and video systems. All VCRs, camcorders and
TVs are full of them. Heck, you couldn't even
make a CD player without them. What makes
integrated circuits so great?

The beauty of the IC is that you can cram
a whole lot of circuitry on a tiny, reliable, in-
expensive chip. What once took boards full
of components, if it could be done at all, now
fits in the palm of your hand. Today's micro-
processors and RAM chips have millions of
transistors on each chip, and other kinds of
chips range from hundreds to thousands of
"parts." I use the quote marks because these
parts aren't really separable entities the way
transistors and resistors are. In fact, they're
nothing more than photographically deposit-
ed chemical structures, etched much like print-
ed circuit boards, except
on a microscopic scale.
And I do mean micro-
scopic. In fact, some are
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Although the actual
chips are small, typically
a few millimeters on a side, they are encased
in much larger packages. So, it's not hard to
handle or work with them. There are several
standard types, so let's look at the ones you're
likely to see.

DIP: No, I'm not calling you a name. DIP
stands for dual inline package, and is the stan-
dard term for those centipede-looking things
filling so much of our gear. A typical DIP has
either 8, 14 or 16 pins, divided into two rows
of 4, 7 or 8. Each row sticks out from one side
of the black, plastic package, inside of which
is the actual chip.

Amplifiers often come in 8-pin DIPs.
Audio power amps may have numbers such
as LM380 or LM386. The LM386, in partic-
ular, is a small audio amp which is used in all
kinds of radio equipment, and also makes a
dandy experimenter's chip; you can get them
at Radio Shack for \$1.19. Walkies and QRP
rigs often use them, although some walkies

the tech side

by Michael Jay Geier KB1UM

use the miniature, surface-mounted version,
which is the same amplifier in a smaller
package. The LM380 offers a bit more audio
output, and you may find it in CB sets, QRP
(low-power) ham rigs and some bigger radios.

Other kinds of amplifiers also come in
8-pin DIPs. One important type is the "op
amp," or operational amplifier. This is a de-
vice used for low-level amplification; op amps
aren't meant for driving speakers. But, you'll
find lots of them in just about everything.
American-made gear seems to use more op
amps than Japanese stuff, but they use them
too. Typical numbers would be LM-318, LM-
307, 741 or TL-082. When replacing op amps,
it can be important to use the same type, al-
though sometimes you can be flexible with
that, depending on the circuit. If in doubt, get
an exact replacement. Op amps aren't expen-
sive; a 741 goes for 79 cents at the Shack.

One very common 8-pin part is the 555
timer chip. This thing has been used in so many
timing and oscillating circuits that it must truly
be the king of chips. It's probably one of
the most-used parts in existence. Parts like the
LM-555 and NE-555 are interchangeable. The
ICM-7555 and TLC-555, though, are CMOS
versions that, while pin-compatible, may not
work in some circuits designed for the
standard part.

Fourteen and 16-pin DIPs are frequently
used for logic circuits. If you see a number
like 7413, that's a TTL (transistor-transistor
logic) logic gate. 74LS is the prefix used for
low-power TTL. A number like 4093 is a
4000-series CMOS (complementary metal

*"The beauty of the IC is that you can cram
a whole lot of circuitry on a tiny, reliable,
inexpensive chip. What once took boards
full of components, if it could be done at all,
now fits in the palm of your hand."*

oxide semiconductor) logic gate. Confusing-
ly, 74HC is also CMOS, but that series is
designed to be pin-compatible with TTL.

Some op amps come in these bigger
packages. Look for numbers like LM-324,
1458 and TL-084. Unlike the 8-pin op amps,
which usually have two amplifiers per pack-
age, most of these have four. When you trou-
bleshoot, remember that it is possible for one
to be bad while the other three work. The
only fix, of course, is to replace the entire
package. Luckily, you're still only talking
about a dollar or two.

Also in medium-sized DIPs are some RF
processing chips. Numbers such as MC3357
and MC3359 are FM IF (intermediate
frequency) chips made by Motorola, and you'll
find them in the receiver sections of lots of
walkies, scanners, cordless phones and other
VHF/UHF FM gear. If you see LM-series chips
this size, they may also be RF processors of
some kind, especially if they have four-digit

numbers. The LM or MC 1488 and 1489,
though, are "line drivers," or signal amplifiers,
used with computer serial ports. They're very
common in all kinds of equipment which is
connected to computers, such as computer-
assisted HF transceivers.

Finally, older RAM chips were made in
medium DIPs. The 4116 and 4164 come to
mind. Naturally, you'll find most of those in
computers. Of course, there are other medi-
um DIP parts, including voltage regulators,
stepper motor drivers and what have you, but
these are the most common ones.

Bigger DIPs can hold computer and spe-
cial-purpose chips, such as parts for frequen-
cy synthesizers. The number of pins can range
from 18 on up to 40 or so. That's a lot of pins!
Look for numbers like 6502, 6800, Z80, 8088
and MC68000.

SIP: A less common package is the SIP, or
single inline package. SIPs are vertically
oriented, with one row of leads exiting one of
the narrow sides of the package. Some audio
amplifiers, op amps and special-purpose parts
are packaged this way, but you won't see many
of them.

Line 'Em Up

Whenever you replace a DIP, it is crucial
that you put the new one in the right way
around! That might seem obvious, but you al-
so might be surprised at how often equipment
is seriously damaged due to inexperienced ser-
vicers' making this mistake. The key to a DIP's
orientation is pin 1. How do you find pin 1?
Look for a notch in the package, on the top.
It'll be either a semicircular cut into one end,
or a dimple on top, next to pin 1. If it is an end
cut, find pin 1 by looking at the chip from the
top, with the leads facing down and away from
you. Put the notch to your left, and pin 1 will
be the leftmost pin on the bottom row. By the
way, unlike with some connectors you may
have wired, the pin numbering of ICs goes
around in a circle. So, on an 8-pin DIP, pin 4
is on the bottom right, and pin 5 is directly
above it. That puts pin 8 above pin 1. It's a
helpful thing to remember when you're try-
ing to take measurements.

Quads: These days, chips are getting so
complex that many have lots and lots of pins.
A DIP would be awfully long and cumber-
some, so manufacturers
have started making square
chips with leads on all four
sides! This package type
is quite popular in Japanese
gear, especially for mi-
croprocessors and big
custom signal processors
of the kind found in CD
players and video equip-
ment. Most of these chips
are surface-mount style,
with lots of leads very

close together. Some chips have up to 100
leads! Yes, it is possible to replace such a part,
but it ain't easy. You need a very fine iron,
solder wick, a magnifier, excellent dexterity
and plenty of experience. It is very easy to de-
stroy both the chip and the circuit board when
trying to remove or replace one of these things.
I don't recommend you try it unless you're re-
ally sure of yourself. Luckily, you aren't like-
ly to need to do it. Sure, these big parts can
go bad, but most of them are deep within cir-
cuits where there's plenty between them and
such disasters as reversed power polarity or
static discharge. Also, many of them are
CMOS, which is a pretty low-power, reliable
technology.

Well, I thought we'd finish this up, but there's
still just a little bit more. I promise we'll be
done next time and move on to something else.
Until then, be careful, have fun and keep
learning. 73 from KB1UM. **RF**



radio magic

by Michael Bryce WB8VGE

Armed with some knowledge of what a transistor looks like on paper, and having a good idea how it works, we can take another step in decoding the many lines and icons on a schematic.

There are two basic elements making up all electronic circuits: the resistor and the capacitor. There are several important features about both of these rather common components. Let's look at the resistor first.

Resistors

As the name implies, a resistor *resists* current. How much the resistor deters current is given as a value in ohms. Resistors come in values from less than an ohm up to several megohms. The higher the value, the more *resistance* the resistor has. A resistor can pass AC, DC and, up to certain constraints, RF. Resistors also have a current rating, usually given in watts. Most of the resistors in our rigs are 1/4 watt. Older tube-type radios had resistors with ratings up to several watts.

Resistors *usually* just don't up and go bad. They can change value over time, usually measured in years. But for one to just up and die is very, very odd indeed.

Let's try some experiments. They're a great way to get some hands-on touchy-feely with real-life components. Make a trip to the local Radio Shack store. Pick up the following items:

- One 6-volt lantern battery
 - One package of 1 megohm 1/4 watt resistors
 - One package of 100k 1/4 watt resistors
 - One package of 1k 1/4 watt resistors
 - One package of 8.2k 1/4 watt resistors
 - One package of clip leads
- And, if you don't already have one, you'll

need a good digital VOM. Radio Shack carries quite a few nice ones, so pick out one—you'll need one down the road, so you might as well get it now.

Here's what we're going to do: Take your battery and the package of 1 megohm resistors. Using the clip leads, hook up the resistor and battery as shown. Set your VOM to read DC voltage and probe the battery's terminals. You'll see something on the order of 6.3 volts or so. Now, leave the negative lead of the VOM connected to the negative terminal of the battery and measure the voltage at the end of the 1 megohm resistor. What do you see? Hmmmm... about 6.3 volts. How can this be? With a 1 megohm resistor in series with the VOM, how can I still read the same voltage at the battery terminals? Well, add the second 1 megohm resistor in series with the first one and measure the voltage again. What? Still reads 6.3 volts? The reason is because there is no current flowing, therefore no voltage drop across the resistor.

OK, before the hate mail starts, yes, there is a minuscule amount of current flowing through the resistors and the VOM. But it is so measly we can forget about it. Most digital VOMs have a rather high impedance, around 100 megohms. Had we used an older, low impedance VOM, we could *load* the circuit down without test equipment. Keep this in mind when working on circuits. Always use high impedance test probes to avoid loading the circuit down. This is especially true when working with low power oscillators. It's not at all uncommon to stop an oscillator by the test gear, giving you false clues in your hunt for trouble.

Let's change the way we have the resistor

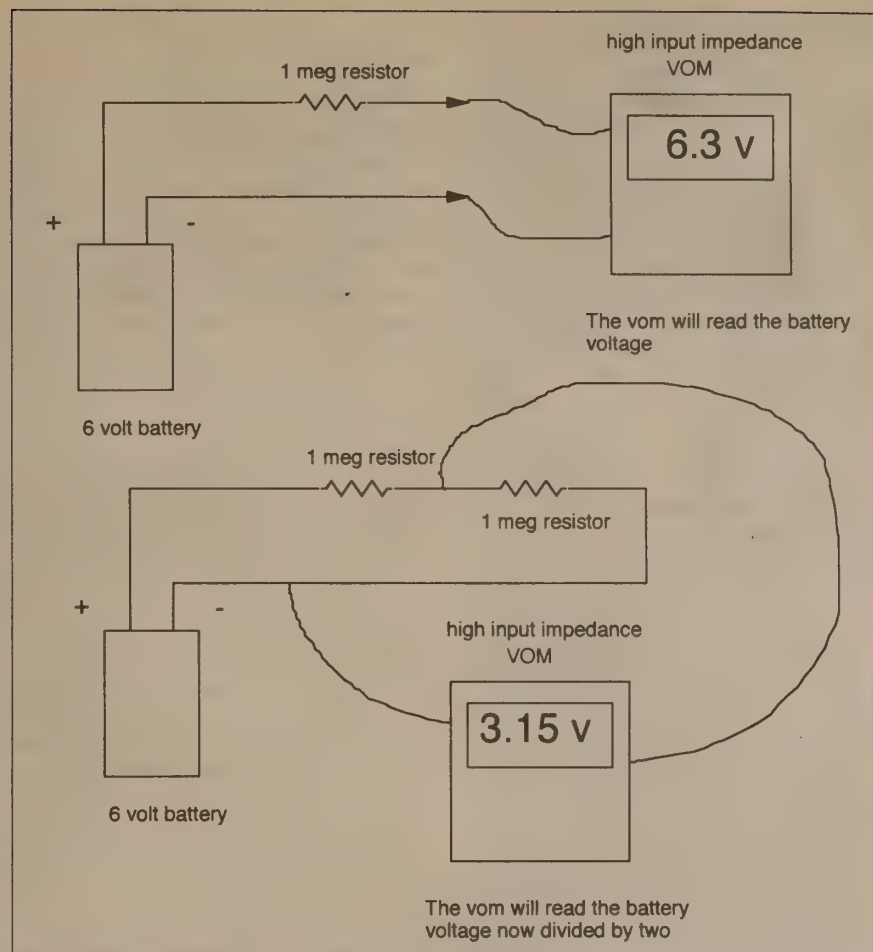


Figure 1. In the first example the VOM reads the entire battery voltage. In the second example, the VOM reads the battery voltage divided by two, because both resistors are of equal value creating a voltage divider.

connected. This time, connect both resistors in series, but clip one to the negative lead of the battery. Now, using your VOM, measure the voltage at the junction of the two resistors. Whoa! Now you'll read 3 volts. Because both resistors are the same value, the drop across them will be equal. That's why the voltage is exactly half that of the supply voltage; in this case, from the 6 volt battery. Lay the 1 megohm resistors aside for now. Break out the 100k resistors and connect two of them up in the same way we did with the 1 megohm resistors. Again, check the voltage at the junction of the two 100k resistors. Again, the voltage will be the same. But, the current flowing through the two has increased! Again, no matter what two values you use, as long as they are equal, you'll divide the battery voltage in half.

You'll see this all the time in schematics. The use of *voltage dividers* can be found everywhere. A classic example is the setting of an operating bias on a transistor. By selecting the proper values of resistors on the base of a transistor, we can select the type of operating class the transistor will be in. I'll talk more about this later on in the series. But when you see something like what is shown in Figure 2, you'll have a good idea what is going on.

Meet Mr. Ohm

There is a relationship between voltage, current and resistance. It's known as Ohm's Law. At its simplest, Mr. Ohm states that if you know any two values, you can always find the third. In our examples, let's calculate the current flowing through both sets of resistors. Let's take the pair of 100k resistors first. We know the following:

- Voltage, or E, is 6 volts
- Resistance, or R, is 200,000 ohms. (resistors in series add up)

So, current is the unknown factor. Therefore:

We need to take E divided by R to get I or current.

Mr. Ohm is simple to remember by using this form:

$$E/R = I$$

All you have to do is cover up the part of the formula you want to find and do the math shown. It's calculator time: 6 divided by 200,000 = ?? For the second set of resistors, 6 divided by 2,000,000 = ??

In my example, all we wanted to figure out was the voltage drop across the two resistors. Mr. Ohm also comes in handy when you need to compute the current flowing in a resistor, or if you want to know the voltage when you already know the current and resistance. This is a basic part of electronics. While you don't need to know Ohm's Law backwards and sideways, you should have a good understanding of why it works.

Take a closer look at Figure 2. Let's say you're troubleshooting this part of the rig. At the junction of the two resistors you should measure half the supply voltage. But wait—instead of seeing 6 volts, you read the entire supply voltage of 12 volts. What's wrong? Well, resistor R2 may have opened up. Naw, look at the values of the two resistors: At 22k each, R2 would never open up due to excessive current flowing. Instead, I would check for a cold solder joint at the ground end of R2.

On the other hand, let's say you check the junction of the two resistors and read 1 volt. Since both resistors are 22k, there's little current flowing and thus no burned resistors or charred PC boards. This time I would suspect that, more than likely, Q1 has a base-to-emitter short. This B-to-E short is pulling the voltage down at the junction of the two resistors. I would bet the farm that replacing the transistor will fix the problem.

As you can see, you don't need to be an electronic expert to figure out what is going on inside your rig. It doesn't matter if it is the newest import or the simplest home-brew QRP transmitter, you can always count on Mr. Ohm.

RF

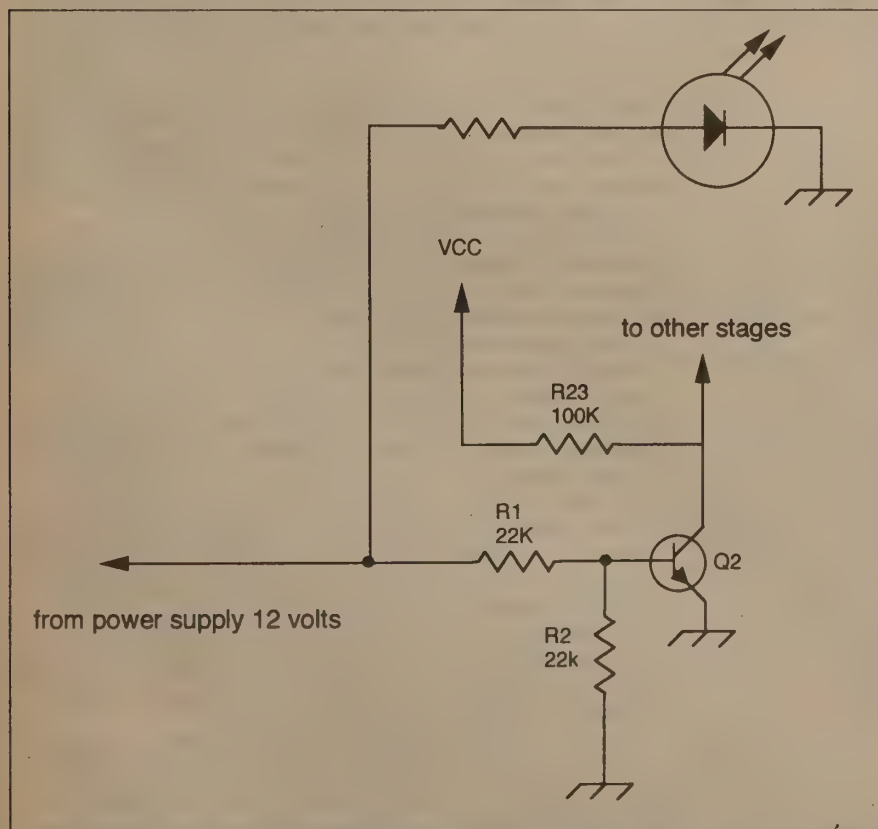
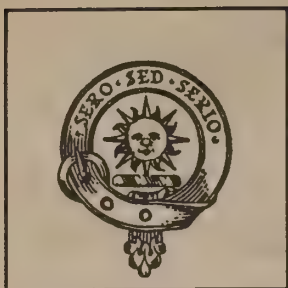


Figure 2. Can you spot the voltage divider in this circuit? It is used to set the bias voltage for transistor Q2.



Joe Carr

antennas, etc.

by Joseph J. Carr K4IPV

The G5RV Multiband Antenna

There are a number of approaches to achieving multiband operation of antennas in the HF bands. If you have lot of money, then it is relatively easy to hire an antenna contractor, and have them install several kilobucks worth of towers, beams, multiband verticals, etc. On a more modest basis, one can buy a commercial multiband vertical. I have a Cushcraft R5 at my location (it is a half wavelength vertical that works on five HF bands, without radials). Other approaches are home-brew, which we will take a look at from time to time as space permits. This month we will take a look at the G5RV multiband antenna.

The G5RV is controversial for several reasons. One reason is the originator of the antenna. The name "G5RV" is the callsign of the claimed originator, Louise Varney, a British ham operator. Others claim that the G5RV antenna is nothing but a 1930s or 1940s vintage design for the military by Collins Radio. However, the similarities between the Collins antenna and the G5RV are, it seems to me, at best a case of "further development" or "co-invention," rather than something more sinister. Because of the obvious differences between the two antennas, I prefer to continue the credit due to G5RV.

Another reason for the seeming controver-

sy over the G5RV is perhaps the "NIH syndrome" (Not-Invented-Here). The G5RV is a lot more popular in Europe, especially in the United Kingdom (G, GW, GM, GI) than in the United States. In my own experience, the G5RV tends to be built in the U.S. by antenna experimenters, and most of those who I've talked to are happy with the results.

Still another controversy is over whether, or how well, the G5RV works. A reviewer of one of my books (*Joe Carr's Receiving Antenna Handbook*, HighText Publications, 1-800-247-6553) stated that he "... wish(es) the G5RV would just go away." The same reviewer stated that it would be better to just put up a "... dipole of the same size." WRONG! The dipole is a single-band resonant antenna, where the G5RV will work on several harmonically related bands. The G5RV has two poles, but it doesn't exactly fit into the "dipole" category.

Physical Structure of the G5RV

The G5RV antenna looks like a dipole, to be sure, but it is considerably longer. Unlike many multiband antennas, the G5RV is not cut to the lowest frequency of operation, but rather to the middle frequency. For a high-frequency ham band antenna, one designs it for 20 meters (14 MHz).

Like the dipole, the G5RV is fed in the

center. Unlike the dipole, a matching section made of 450 ohm or 300 ohm twin-lead transmission line (450 ohm preferred) is connected between the antenna feed point and the 75 ohm coaxial cable. The length of each radiator element ("A") is:

$$A = \frac{722}{F_{\text{MHz}}} \quad \text{Feet} \quad [1]$$

While the length of the matching section is:

$$B = \frac{480V}{F_{\text{MHz}}} \quad \text{Feet} \quad [2]$$

Where: "A" is the length of each radiator element in feet, "B" is the length of the 450 ohm matching section in feet, F_{MHz} is the middle frequency of operation, and "V" (used in Equation [2] only) is the velocity factor of the twin-lead (typically 0.82 for twin-lead and 0.99 for open-wire parallel line).

In case you don't like to do arithmetic, the calculations are already done for the ham bands: A = 51 feet (2A = 102 feet overall), and B = 34 feet for open-wire transmission line and 27.5 feet for 300 ohm or 450 ohm twin-lead. There is some argument over these figures, but they are regarded by many hams who have actually used the antenna as a good trade-off.

If you want more technical details on the G5RV, Louis Varney is the principal source, as he is the inventor. The same article appears in Varney (1984) and David (1991); the latter is a reprint of the former. The Varney article gives the basis for operation of the G5RV antenna on 3.5, 7, 10, 14, 18, 21, 24 and 28 MHz. The VSWR on each band is a bit different, and Varney recommends the use of a transmatch or similar coax-to-coax antenna tuning unit between the transmitter and the input to the coaxial cable transmission line.

There is a possibility of an unbalanced line condition existing that can cause some radiation from the feedline ... and that can cause TVI and other unpleasantness. The solution to this problem is to wind the coaxial cable into an in-line choke at the point where the coax connects to the twin-lead or parallel line

matching section. This is done by winding the coax into a 6"-diameter coil of 10 turns right at the feed point. The coiled coax can be secured to the center insulator with tape, string or some other mechanism.

Baluns On Receiver Antennas?

Above I mentioned a reviewer who did not like the G5RV antenna. The same reviewer (who, by the way, had a serious conflict of interest in reviewing any ham books), stated that he did not believe that 1:1 balun transformers are useful on half-wavelength dipole receiving antennas. My professional, well-considered response is: horsepucky! The purpose of using a 1:1 balun (which after all provides no impedance transformation) is two-fold.

First, as in the transmit case, the balun prevents radiation from the transmission line. Perhaps the reviewer was thinking of TVI as the reason for avoiding feedline radiation. But, as ample test chamber evidence shows, the radiation from the feedline tends to distort the figure-8 azimuthal pattern. When a balun is used, the currents are balanced, and the radiation pattern is restored. And guess what? Antennas are reciprocal in nature ... they work the same on receive as on transmit.

The second reason is that the receiver antenna feedline may pick up strong signals from powerful local stations. Other hams and AM broadcast band stations are particular problems. Any large signal at the input may challenge even the best receiver's front end, but if the receiver design is in any way mediocre in the dynamic range department (and many are!), then the signals picked up on the dipole transmission line shield can overload the front end of the receiver. Using a 1:1 balun transformer between the antenna feedline and the radiator elements balances out the currents and seriously reduces the amount of signal seen by the receiver input. 'Nuff said?

If you have any questions you'd like to see answered in this column, or any have any suggestions for future topics to be covered, then contact me at P.O. Box 1099, Falls Church, VA, 22041. RF

References and Suggestions for Further Reading:

- Carr, Joseph J. (1993); *Joe Carr's Receiving Antenna Handbook*, HighText Publications, Inc., Solana Beach, CA; (1-800-247-6553).
- Carr Joseph J. (1994); *Practical Antenna Handbook*, 2nd Edition; TAB/McGraw-Hill, Blue Ridge Summit, PA; (1-800-233-1128).
- David, Erwin G4LQI, editor (1991); *HF Antenna Collection*, Radio Society of Great Britain (Potters Bar, Herts, UK).
- Moxon, Les, G6XN (1982); *HF Antennas for All Locations*; Radio Society of Great Britain (Potters Bar, Herts., UK).
- Varney, Louis, G5RV (1984). "The G5RV Multiband Antenna," *RadCom* (Radio Communications), July 1984. Reprinted in *HF Antenna Collection*, Radio Society of Great Britain (1991, Potters Bar, Herts, UK), Erwin David, G4LQI (editor).

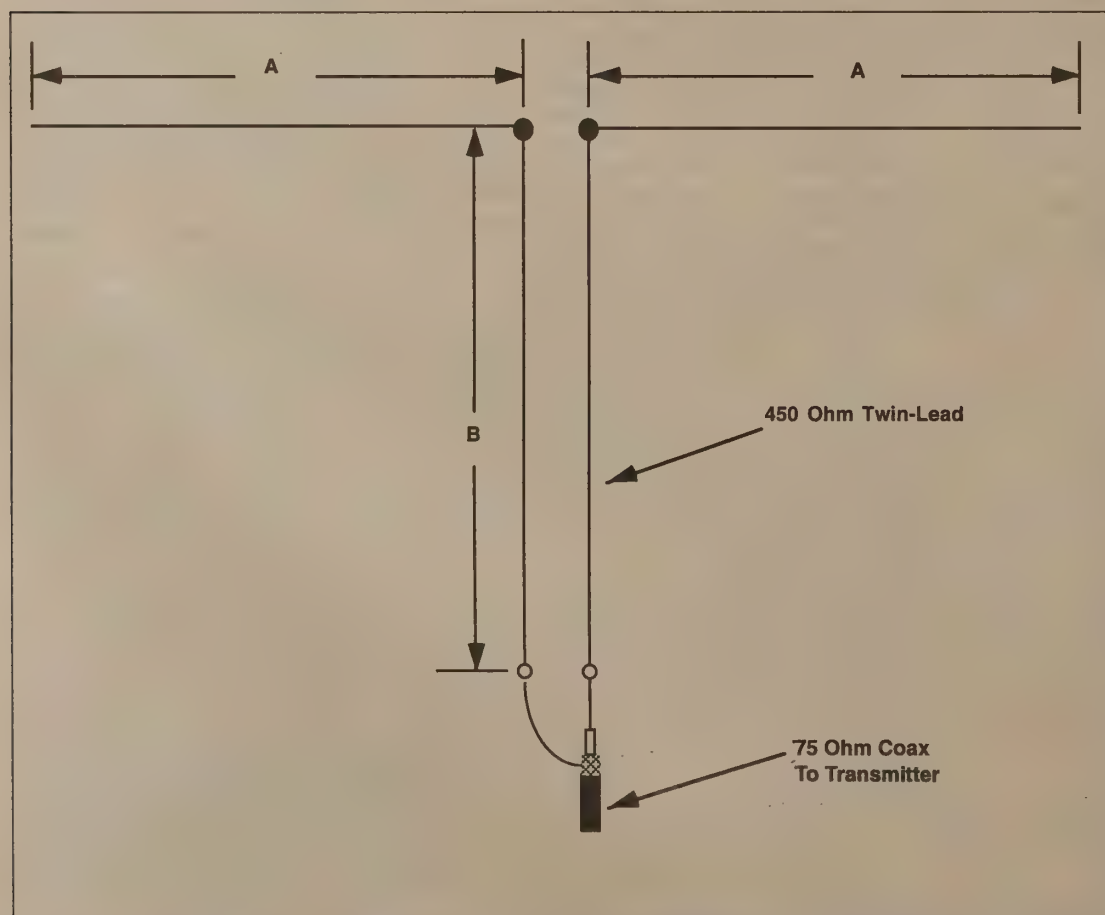


Figure 1. The G5RV multiband antenna for HF bands 3.5-28 MHz.



what's next?

by Carole Perry WB2MGP

Blast Off with New Materials

In today's world of instant data retrieval, most school textbooks are obsolete by the time a new set arrives in the classroom. This is especially true of science and social studies books. Political and geographical boundaries are constantly changing; and scientific data, especially as it involves space exploration, is rarely up to date in the school network of informational materials. It is incumbent on those of us who incorporate space travel units in our ham radio curriculum to keep our materials as current as today's newspaper.

The unit on Space Travel and Communications is indeed one of the most popular ones that I do with my sixth, seventh, and eighth-grade ham radio students. As a preliminary lesson to a SAREX contact or as a follow-up unit to a QSO with an astronaut on the ground, most of the kids really enjoy following their interests by exploring the myriad of activities and materials about space that I make available to them in the classroom.

Resources

In the September issue of *Learning 94*, an excellent teacher's publication, there were many good ideas for resources to help celebrate the accomplishments of the Apollo 11 mission and the moon. Approximately one billion people around the world watched the first manned moon landing on July 20, 1969. Twenty-five years later, nations all over the world are celebrating this incredible accomplishment. You can adapt the materials and lessons to the abilities and interests of the youngsters you teach. Certainly, there should be a reference center in your classroom which reflects current information and news about the

space program. Here are some of the suggested materials:

Computer Materials—"Stars and Planets" (Apple II GS). These six games include space-ships, stars, and planets. An on-screen astronaut collects moon rocks. Early reading, math, and logic skills are included. For ages 3-6.

"Lunar Greenhouse" (Apple II). This botanical activity involves attempts to grow different vegetables on the moon. For ages 8-10.

"Space Station Freedom" (Apple). The students match astronauts to their missions on the basis of biographical information. For ages 10-12.

Books (Fiction)—*Mooncake*, by Frank Asch (Prentice-Hall, 1983). For ages 4-6.

Legend of the Milky Way, by Jeanne M. Lee, reteller (Holt, Rinehart & Winston, 1982). For ages 6-10.

Thirteen Moons on Turtle's Back: A Native American Year of Moons, by Joseph Bruchac and Jonathon London (Philomel Books, 1992). All ages.

Books (Nonfiction)—*I Want To Be An Astronaut*, by Byron Barton (Crowell/Harper-Collins, 1988). For ages 5-6.

Album of Spaceflight, by Tom McGowen (Rand McNally, 1983). For ages 9 and up.

Voyager: Exploring the Outer Planets, by Joan Marie Verba (Lerner, 1991). For ages 11 and up.

Magazines—*Odyssey* published by Cobblestone Publishing, Inc., 7 School, Peterborough, NH 03458. Call 1-800-821-0115 for back issues of the "Magnificent Moon."

Aerospace Explorer is a children's magazine with articles related to space exploration. The address is 1516 W. Lake St., #102, Minneapolis, MN 55408-9917.

Special Resources from NASA—NASA Teacher Resource Centers in 11 locations around the country offer educational videotapes, slides, audiotapes, publications, teaching guides, and more. Call the NASA Goddard Space Flight Center Teacher Resource Laboratory at (301) 286-8570 to ask for the location and phone number of the center nearest you.

Miscellaneous The Young Astronaut Council, with its Young Astronaut Program and Young Astronaut Clubs, can provide information, curriculum materials, activities, and other ideas for space-related projects. Contact the Young Astronaut Council at 1308 19th St., NW, Washington, DC 20036; (202) 682-1984.



Photo A. A good teacher should provide current resources and materials for research in the classroom. Technology materials should constantly be updated. Student Steven Price displays a shuttle model.

Include at least one unit about space in your ham radio program; the kids will love it!

It's time to refer youngsters who are articulate and enthusiastic about the hobby to be interviewed for Dayton '95. Please have them call me at (718) 983-1416. **RF**



Photo B. Seventh-grader Kimberlie Kalman is enjoying wonderful follow-up projects from a unit on space and communications.

Low Power—High Fun

Continued from page 21

The Special Events Station

I awoke early on Saturday to a beautiful clear and crisp day, perfect weather to be outside operating ham gear. The students started to arrive early in the morning and were talked into the campsite using a prearranged 2 meter simplex frequency. I showed one group how to put up a dipole using a bow and arrow. The antennas went up with little problem and the station was on the air in no time.

I fired up the Yaesu 301 on 40 meters SSB. I heard someone calling CQ and came back to them. It was Chris W8SH, and he was operating another Special Events station. He was a 59 and gave me a 59 signal report. I told him what we were doing. He reported, "Special Events, you are a 59, that is what the meter reads, and the audio is good quality."

I then handed the microphone to Rick. The second station Rick worked was KB9HVVH, Phil in Illinois. Phil was a 59 and he reported we were a 57. Rick talked to Phil for a while, then Andy KR4FS in Virginia gave us a call. Once again he was a 59 and we were

a 57. Andy said, "You are doing a good job into Virginia."

Phil came back in and said, "I thought I might do an experiment and back the power down to 5 watts." He came back and there was very little difference in either signal strength or audio quality. Andy came back to Phil and reported "I also noticed no difference." Phil decided that QRP on SSB can be quite effective and was worth doing some more.

The bands were in very bad condition and we were forced to work mostly on 40 and 20 meters. We did manage to work stations across the country and all the way across Canada. The students were really getting into operat-

ing HF. They were asking a lot of good questions about operating procedures and protocol.

Afterwards, two of the students who had arrived after the station was set up were interested in learning what is involved in putting up a dipole. I helped them put the 20 meter dipole up about 35 feet. I showed them how to check the SWR and bandwidth of the antenna using my MFJ antenna analyzer. The antenna was better than 1.4:1 across the entire CW and SSB portion of the band. One of the students set up operations on 20

meters using the dipole and the MFJ SSB transceiver. Even though the band conditions were extremely poor he managed to work Julio EA1UX in northern Spain. We almost had our eardrums ruined from the shout he

let out after that QSO was over. He managed contacts across the country and Canada. We also had a nice long QSO with John ZD7WRG, who was very interested in the station setup and operating conditions.

After the two stations had been under control and operating for a while, Rick and I packed up the portable PVC verticals and MFJ QRP rigs and headed for some of the remote sites in the park. We had fun setting up and I almost got blown off a 175-foot cliff at one point.

I think the QRP adventure was a definite success. We didn't break any records with the number of stations we worked, but we did meet all our objectives. We had a large number of positive comments on the air by people who had never heard anyone using low power for phone contacts (SSB). The students had a great time, learned a lot, and have been motivated to upgrade. Avery KE4ERW sent Rick and I these comments:

"I appreciate the helpful information that you gave, and it will help me on my way to get my General Class license. I had a blast. It isn't often that I get to talk on 20 and 40 meters, except for the last Field Day. The QRP experience was new and great. Thanks for inviting us and also for all the advice given that day." **RF**

"We had a large number of positive comments on the air by people who had never heard anyone using low power for phone contacts (SSB). The students had a great time, learned a lot, and have been motivated to upgrade."



upgrade ... don't stop now

by Gordon West WB6NOA

More Than Remotely Possible

1995 will be the year of mobile remote-head transceiver installations. All amateur radio mobile transceiver makers are previewing selected models where the head can be detached from the transceiver box and be placed almost anywhere on the dash.

Even high frequency 100-watt transceivers can be remote-mounted, too. Yaesu originally came out with a remote kit for their popular FT-747 HF transceiver, but the cable kit was relatively expensive, bulky, and would sometimes cause the set to lock up on transmit when RF got into the analog remote-cable system. But that's all changed with the latest introduction from Yaesu of their FT-900AT where the head easily removes, and digital logic between the head and the body up and down the tiny cable is impervious to RF lock-up problems.

The SGC Model 2000 HF transceiver and the ICOM M800 HF transceiver are also capable of the head splitting apart from the body of the equipment. The unique part of the SGC 2000 remote head system is that a total of eight different heads can run off of one transceiver body, the answer to the requirements of an emergency operation's center van or the world's largest mobile home.

Kenwood and ICOM both offer a remote-controlled head for their VHF/UHF 1.2 GHz transceivers, and both Kenwood and Yaesu offer dual-band VHF/UHF sets with remote-head option. The ICOM IC-901 series is another favorite remote-control setup—you can drive as many as seven different band units off of one IC-901 ICOM head, and this makes for a slick setup.

But one major area of the remote-head installation that may not be emphasized enough in the installation book (i.e., instruction manual) is the fact that placing the transceiver body way back in the trunk of the vehicle is going to lead to major battery wires coming from the battery and going all the way to the trunk.

"I knew exactly what the problem was when I got to looking into the motor home installation where the remote-control transceiver would 'brown out' on transmit," comments Bill Alber WA6CAX, a specialist in high frequency mobile marine and aeronautical mobile installations. "The red wire feeding the remote box was size '00,' plenty big enough to handle the 20-amp current draw from the battery 15 feet away. But whoever installed the transceiver tried to utilize the chassis ground as the return to the battery negative lead, and poor ground connections couldn't do what a big black '00' wire could do," adds Alber.



Photo A. A case for remote heads!

Lesson learned—*never* try to use the vehicle chassis as a negative battery return connection. Always run major-sized red and black wires to the remote-controlled equipment, and bond the chassis of the equipment to the vehicle chassis for a good ground. Don't mistake ground for battery negative return.

Another problem that must be addressed in remote installations is the necessary fusing of the red wire right at the positive battery post. Fuses down by the transceiver box in the trunk in no way protect that long 12-volt battery run from a catastrophic short-out. If you are running a minimum of six-gauge wire from engine battery compartment to the trunk of your vehicle, that wire can get red hot in a matter of seconds if it should get pinched to the vehicle chassis or shorted to their return black lead. A fuse right at the red battery positive post is *positive* assurance that you won't burn up your vehicle if things get shorted out on the way back to the trunk.

In fact, mounting the transceiver body back in the trunk is not necessarily the best way to go for ease of installation. Check to see whether or not you may have room under the passenger seat. But avoid placing anything under the passenger seat if the seats are motor driven. I once saw a transceiver crushed in a Mercedes Benz when the passenger started maneuvering the seat for a comfortable ride.

Once you have found a safe spot for the transceiver body, be sure to ground it with thin copper foil to the chassis to assure a good bond with the vehicle frame. This will minimize noise pick-up, and the unlikely possibility that RF locks up the head on transmit.

Place the remote head anywhere that gives you

good driving visibility for safety. Don't put it down low where you have to take your eyes off of the road ahead. Most heads can take a tremendous amount of heat, so don't hesitate to get it up on the dash, even though the sun may bake it. Throw a towel over it when you're not using it, or better yet, pull it off the dash and keep it out of view so it doesn't get swiped.

The speaker audio usually comes from the transceiver body, not from the head. When you're installing the equipment, keep in mind that you're going to need to run a shielded pair of wires for audio. Get the speaker up where you can easily hear it over road noise, and get it firmly affixed to the vehicle so it doesn't become a missile if there's a traffic accident. Same thing with the remote head—make sure it is safely attached to the dash.

Once everything is in place, try transmitting with the engine off, and then on. Make sure that your transmissions don't interfere with how your vehicle normally operates. Try the brakes on transmit—try the power steering—acceleration—the works. This goes with any type of HF system . . . try it out in a big parking lot before you hit the highways and start yakking.

"Also get a handful of inexpensive Radio Shack noise filters and knock out the screech coming from fuel pumps," adds Don Arnold WD4FSY. "On my turbo diesel, the little Radio Shack filters effectively knocked down two S-units of noise from the two fuel pumps," adds Arnold.

The new remote-controlled transceivers will definitely add safety to your driving. They also allow you to stow the heads when you get to where you're going so no one sees that radio equipment sitting under the dash. Check out these new sets today!

RF

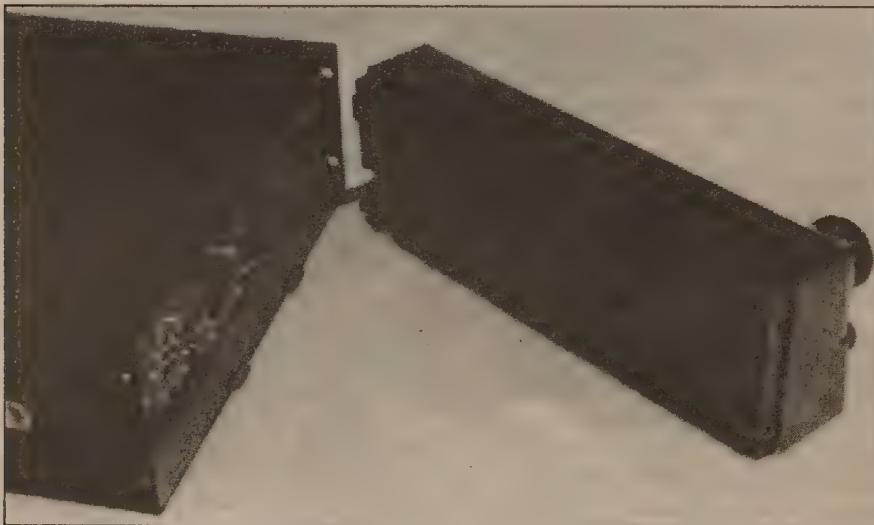


Photo B. It's a one-minute task to separate the remote head from the radio.

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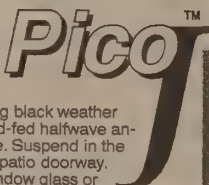
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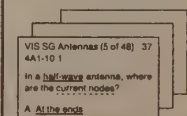


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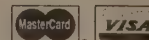
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The *Radio Fun Flea Market* costs you peanuts (almost)—comes to 25 cents a word for individual (noncommercial) ads, and 80 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad. This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and maybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using.

Send your ads and payment to *Radio Fun Flea Market*, Judy Walker, 70 Route 202 N, Peterborough NH 03458, and get set for the phone calls.

MINIATURE POLICE RADAR TRANSMITTER one mile range, \$45 assembled. 9025 Coldwater Rd., Building 100A, Fort Wayne IN 46825. RF251

AMIGA, MACINTOSH, ATARI XL/XE/ST Amateur Radio PD Software \$4.00 disk. Two-stamp SASE brings catalog. Specify computer! **KINETIC DESIGNS HAMWARE**, Box 1646, Orange Park FL 32067-1646 RF266

QSL SAMPLES—50 cents. **SAMCARDS**, 48 Monte Carlo Dr., Pittsburgh PA 15239. RF275

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PRINTED CIRCUIT BOARDS for projects in 73, *Ham Radio*, *QST*, *ARRL Handbook*. List, SASE. **FAR CIRCUITS**, 18N640 Field Ct., Dundee IL 60118. RF595

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MILLIWATERS: LOW BAND QRP transmitter plans, \$1.00. EASY ASSEMBLY! **CAPULET, INC.**, P.O. Box 86, Getzville NY 14068, (716) 691-8656. RF795

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activities calendar

Send your announcements to: *Radio Fun Activities Calendar*, 70 Route 202-N, Peterborough NH 03458. We'll print as many as space allows, on a "first come-first listed" basis.

DEC 10

FARIBAULT, MN The annual Courage Center Handi-Ham Winter Hamfest will be held at the Eagles Club, starting with registration at 8:30 AM. There will be a Handi-Ham Equipment Auction, Flea Market, Dinner at Noon, and Program. Talk-in on 19/79. Contact Don Franz W0FTT, 1114 Frank Ave., Albert Lea MN 56007.

JACKSONVILLE, IL Three major clubs are coming together to sponsor a Superfest at 8 AM in the Turner Jr. H.S. VE Exams, Flea Market. Crafts welcome. Contact Tim Childers, (217) 245-2061. Talk-in on 146.775 Rptr, and on 146.52.

JAN 7-8

FT. MYERS The Ft. Myers ARC will hold a Hamfest at Araba Shrine Temple Hall, 2010 Hanson St., Sat. 9 AM-5 PM; Sun. 9 AM-3 PM. Set-up Fri. Jan. 6th, 6 PM-9 PM and Sat. Jan. 7th, 6 AM-9 AM. License Exams Sat. 1:30 PM; Sun. 10:30 AM. No pre-registration required. Flea Market. Forums. Talk-in on 147.345(+) MHz. Contact Jerry Deutscher KQ4UW, (813) 472-5130; Dale Hardin KD4UAO, (813) 277-1984.

JAN 14-15

SARASOTA, FL The 16th annual Sarasota Hamfest/Computer Show will take place at Robarts Sports Arena at the Sarasota Fair Grounds, 9 AM-5 PM Jan. 14th; and 9 AM-3 PM Jan. 15th. FCC Exams. Talk-in starting at 8 AM on 146.31/91, 444.925, and 146.13/73. Write to *Sarasota Hamfest*, c/o Ed Neely, 2632 Sunnyside St., Sarasota FL 34239. Tel. (813) 366-5564.

JAN 15

YONKERS, NY Lincoln H.S., Kneeland Ave., is the location for a Giant Electronic Flea Market being presented by Metro 70cm NETWORK. FCC Exams. Talk-in on 440.425 MHz PL 156.7, 223.760 MHz PL 67.0, 146.910 Hz and 443.350 MHz PL 156.7. Contact Otto Supliski WB2SLQ, (914) 969-1053. Mail paid reservations to Metro 70 CM Network, 53 Hayward St., Yonkers NY 10704.

JAN 21

HAMMOND, LA The S.E. Louisiana ARC will host their 14th annual Hammond Hamfest starting at 7:30 AM at SLU Univ. Center. FCC Exams. Flea Market. Set-up at 6:30 AM. Talk-in on 147.00(-). For info and reservations, write to *SELARC Hamfest*, P.O. Box 1324, Hammond LA 70404.

ST. JOSEPH, MO The 5th annual Northwest Missouri Winter Hamfest will be held from 9 AM-4 PM at the Ramada Inn, I-29 and Frederick Ave. Special Hamfest rates. Sponsors: Missouri Valley ARC, Green-Hills ARC and Ray-Clay ARC. Talk-in on 146.85 and 444.925. Please pre-register for the Flea Market by Jan 10th. Commercial exhibitors, for details write to *N.W. MO Winter Hamfest*, c/o Gaylen Pearson WB0W, 1210 Midway Rd., St. Joseph MO 64506. Tel. (816) 232-8786.

JAN 28

GALLATIN, TN The Tennessee Valley AR Network will hold its 5th annual Hamfest at the Gallatin Civic Center, 8 AM-4 PM. FCC Exams by pre-registration only. Send a completed 610 and a copy of license, or certificate of completion to Ronnie Gilley, 512 Hillside Dr., Gallatin TN 37066. Flea Market Set-up will be Fri. from 4 PM-9 PM and Sat. 5 AM-8 AM. Talk-in on 145.13(-)

and 442.600(+), Fri. 3 PM-9 PM; Sat. 5 AM-2 PM. Contact Bill Ferrell N4SSB, 1120 Douglas Bend Rd., Gallatin TN 37066. Tel. (615) 452-3962 after 5 PM.

JAN 29

DOVER, OH The Tusco ARC Hamfest will be held at the Ohio Nat'l Guard Armory, 2800 N. Wooster Ave., 8 AM-4 PM. Set-up at 6 AM. Talk-in on 146.730/130. Contact Howard Blind KD8KF, 6288 Echo Lake Rd. NE, New Philadelphia OH 44663. Tel. (216) 364-5258.

FEB 4

KNOXVILLE, TN The Shriners of the Kerbel ARS will sponsor KERBELA HAMFEST at the Kerbel Shrine Temple 8 AM-4 PM. Set-up 4 PM-9 PM Fri. and 5 AM-8 AM Sat. Talk-in on 146.34/94. For info contact Paul Baird KY4A, 1500 Coulter Shoals Cir., Lenoir City TN 37771. Tel. (615) 986-9562. FCC Exams by WCARS-VEC. Registrations until 9:30 AM. Mail completed 610 form with check for \$5.90 payable to WCARS-VEC, to Ray Adams N4BAQ, 5833 Clinton Hwy., Suite 203, Knoxville TN 37912-2545. Tel. (615) 688-7771.

SPECIAL EVENT STATIONS

JAN 1

LOS ANGELES, CA The Spanish Int'l Western ARC will operate from Los Angeles CA USA, and from Central and South America 1600 UTC-2400 UTC to celebrate "Feliz Ano Nuevo America." Frequencies: 21.340 USB and 7.260 LSB MHz. Listen for Stations N6TOO, KC6GJD, N6TBX/TG8 and LU9FAN. For a certificate, send QSL to Spanish Int'l Western ARC, P.O. Box 2082, Seal Beach CA 90740 USA.

JAN 1-15

HICKSVILLE, NY The editors of *CQ: The Radio Amateur's Journal* will celebrate the start of the magazine's 50th Anniversary year with a special operating event. Any licensed amateur currently or formerly associated with *CQ* or its sister publications is invited to sign "150" after his/her callsign. Other hams may qualify for the "CQ Gang" award by contacting these stations. Find complete rules for the "CQ Gang" award in the November 1994 issue of *CQ*, or send a large SASE to *CQ Gang Award*, 76 N. Broadway, Hicksville NY 11801. There is no fee for the award.

JAN 14-15

OAK BROOK, IL The 24th Annual Hunting Lions in the Air Contest will be sponsored by the Internat'l Assn. of Lions Clubs, and coordinated by the Lions Club Flea (Sweden). The objective is to create and foster a spirit of international understanding and cooperation among amateurs. This contest is open to all licensed radio amateurs except members of the Contest Committee. Operators interested in more info regarding this contest can write to Contest Committee, Lions Club Flea, Box 106, 642 23 Flea, Sweden.

JAN 28

SAN DIEGO, CA Challenger Jr. H.S. ARC will sponsor Station K16YG to commemorate the 9th Anniversary of the Space Shuttle Challenger tragedy. Operation will be on or near 14.250, 21.350, and 28.350. For a special commemorative QSL card, send QSL and SASE to Challenger JHS ARC, 10810 Parkdale Ave., San Diego CA 92126; or Frank Forrester K16YG by callbook address.

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If you don't read the December issue of *73 Amateur Radio Today*, here's what you'll be missing:

- Build your own rig! This month in *73* we focus on some of the latest and greatest kits available for hams and we look at what it takes to get started. In the "Kit Builders' Primer," Mike Bryce WB8VGE puts his unique spin on what you need to join the kit-building craze. Take the fine art of kit building to the next level with the December issue of *73*!

50 MHz operating capabilities.

- Herbert M. Rosenthal WV5Q walks you through "The CW Operators' Friend." Inspired by "The Morse Messenger" (by Scott Edwards KF7VS, *73 Amateur Radio Today*, June, 1994, page 46), this little gadget allows you to simply push a button to send those frequently-repeated CQs, IDs, and QTHs.

- Frank Kamp K5DKZ shares his insight on "Polarity Protection Plus," a sim-

ple means of home-brewing polarity protection into your next project while adding polarity *correction* as well.

- Build a "DTMF Computer Interface." Richard Taylor K7CAH shows you how to harness the power of your PC to operate DTMF tone controls. Designed around the SK22859 tone-generator chip, this simple project can be built on perf-board or on an inexpensive prefabricated PC board available through *73*.

We bring you *more* great reviews in the December issue of *73*, including: The Oak Hills Classic QRP rig, S & S Engineering's ARK-4 40 meter transceiver kit, the Kenwood TH-22AT Hand-Held Transceiver, the Ameritron ALS-500M Solid-State Mobile HF Amplifier, and the Bencher Chrome Straight Key.

As always, we bring you ham radio's

best columnists. Joe Carr K4IPV helps you build up a one-band receiver preamplifier in this month's "Carr's Corner." Joe Moell, P.E., KØOV takes you foxhunting down under in Australia in December's "Homing In." And, Michael J. Geier KB1UM shows you the ins and outs of troubleshooting kits in "Ask Kaboom."

You get all this plus Uncle Wayne's incomparable "Never Say Die" in the December issue.

You should read the December issue and *every* issue of *73 Amateur Radio Today*! Order now and save \$15 off the cover price. You'll receive a one-year subscription (12 issues in all) to the best ham magazine money can buy, for just \$19.97. For instant service call toll-free (800) 289-0388. Do it today! **RF**

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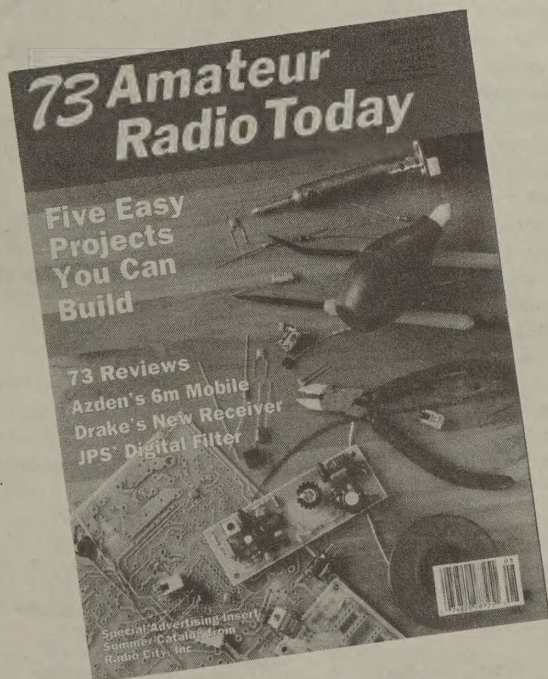
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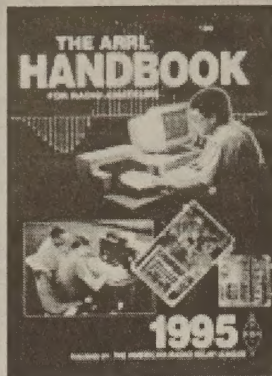
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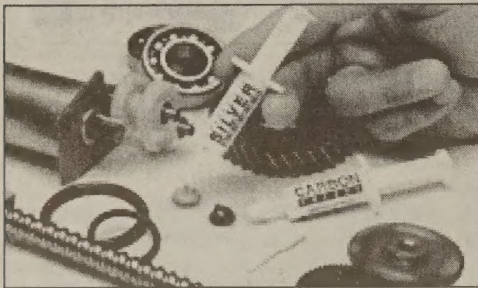
The American Radio Relay League has announced publication of the 1995 *ARRL Handbook for Radio Amateurs*. Now in its 72nd edition, the *Handbook* is considered an authority on technical matters for amateurs and others interested in communications technology. More than 6 million copies have been sold since 1926.

The 1995 edition has been en-



tirely rewritten and contains material superseding all previous editions. New chapters provide a snapshot of amateur radio in the '90s.

The *Handbook* is available at your favorite dealer or bookseller, including Uncle Wayne's Bookshelf on page 27. Or contact *The Amateur Radio Relay League, Inc.*, 225 Main Street, Newington, CT 06111; (203) 666-1541. Or circle Reader Service No. 202.



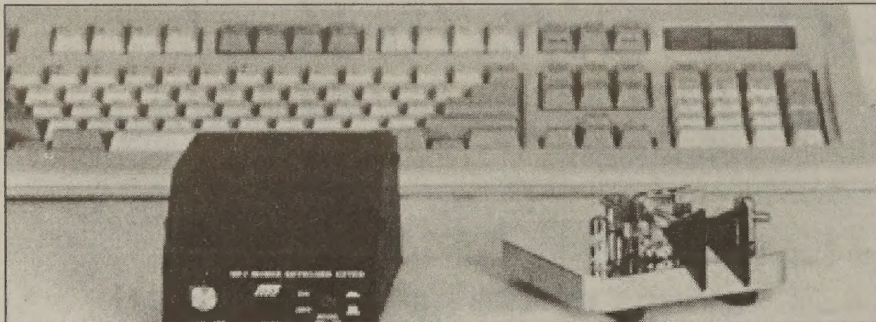
PLANNED PRODUCTS

Planned Products has introduced two new greases developed for applications requiring electrical conductivity, lubrication, and protection. Available in silver and carbon formulations, the new Circuit Works Conductive Greases protect assemblies from wear and from environmental hazards while providing ex-

cellent electrical and thermal conductivity.

When used at low to medium speeds, The 7100 Circuit Works Silver Conductive Grease, and 7200 Circuit Works Carbon Conductive Grease lubricate and protect assemblies while forming conductive pathways, contacts, connections, static drains and grounding. Based on advanced silicone lubricants these new greases are chemically inert, thermally stable and nonflammable. Assemblies are protected from moisture, oxidation, radiation, corrosion, and corrosive atmospheres with a single application.

For more information or to order contact *Planned Products*, 303 Potrero Street, Suite 53, Santa Cruz, CA 95060-2760; (408) 459-8088, FAX (408) 459-0426. Or circle Reader service No. 203.



MFJ

MFJ Enterprises has introduced the MFJ-452 Super CW Keyboard including a two-line LCD display and RFI Supressed Keyboard. This product includes plenty of features and accessories you may not expect to see.

The MFJ-452 features eight 250-character nonvolatile message memories, a 150-character type-ahead buffer, an iambic keyer, and a powerful Morse Code Trainer. Simply turn this unit on and you're sending effortless CW—no computer to boot up, no program to load.

The Perpetual Memory means you can save messages and settings for 20 years without power or batteries.

The MFJ-452 includes a speaker, sidetone, volume control, and jack for external speaker or earphones. The MFJ-452 is priced at \$129.95; the MFJ-452X is the exact same model without the keyboard, priced at \$99.95. For more information or to order contact *MFJ Enterprises, Inc.*, P.O. Box 494, Mississippi State, MS 39762; (601) 323-5869, FAX (601) 323-6551, (orders) (800) 647-1800. Or circle Reader Service No. 206.

RF INDUSTRIES

With RF Industries' new Unicable Kit, you can now mix and match any combination of connectors or adapters to the ends of a 48" cable assembly. Covered in a soft PVC matte blue jacket with matching molded strain reliefs, these cable assemblies are flexible and easy to handle. This extra flexible RF-58A/U type 50 ohm cable with 95% double shielding (tinned copper braid over aluminum foil) is

48" long. Unidapt universal connectors at each end feature machined brass, silver plated bodies, gold plated contact, and Teflon dielectric insulators.

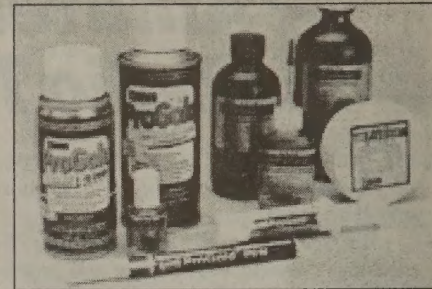
Frequency range is DC to 1 GHz; impedance is 50 ohms; insertion loss is less than .2 dB; and VSWR max is 1.2:1 from DC to 1.5 GHz. For more information visit your local dealer or contact *RF Industries*, 7620 Miramar Rd., San Diego, CA 92126; (619) 549-6340, (800) 233-1728, FAX (619) 549-6345. Or circle Reader Service No. 207.

CAIG LABORATORIES

Caig has introduced an environmentally safe aerosol for its ProGold product. ProGold is a high performance contact cleaner, enhancer, and lubricant that needs no carrier solvents for dilution or cleaning surfaces. The spray container provides short bursts of 100% concentrate via a precision metered valve.

The unique properties of ProGold allow it to deoxidize, clean surface contamination, and penetrate plated surfaces to molecularly bond to base metals—no other product does this. It fills the gaps in the contact surfaces to increase the effective contact area and prevent current concentration at surface peaks.

The result is current is distributed more evenly across the contact surfaces. This increases conductivity and contact surface area and re-



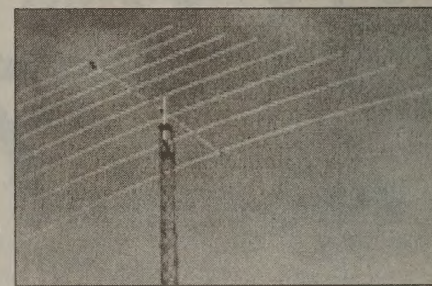
duces arcing, RFI, wear, and abrasion (the major cause of intermittent signals, distortion, and signal loss). For more information contact *Caig Laboratories, Inc.*, 16744 West Bernardo Drive, San Diego, CA 92127; (619) 451-1799, (800) CAIG-123, FAX (619) 451-2799. Or circle Reader Service No. 201.

CUSHCRAFT

The new Cushcraft ASL-2010 Skylog Log Periodic antenna is the answer for hams who would like to have a single antenna that covers 10 meters through 20 meters (actually 13.5 through 32 MHz). This design eliminates the need for two Yagis to cover the traditional bands and 12 and 17 meters.

It uses a single feedline (balun included) and thus there is no need to switch antennas when changing bands. This design does not use traps of any type, thus the wind load is reduced significantly (10.1 sq. ft.). The antenna is not power limited and will easily operate at full legal limit continuously.

The ASL-2010 boom is 18 feet (5.48 meters) long. The gain of the antenna is 6.4 dBd.



Construction is of weatherproof aluminum and stainless steel. List price is \$800. For more information contact *Ken Albertson*, *Cushcraft Corporation*, P.O. Box 2680, Manchester, NH 03108; (603) 627-7877, FAX (603) 627-1764. Or circle Reader Service No. 204.

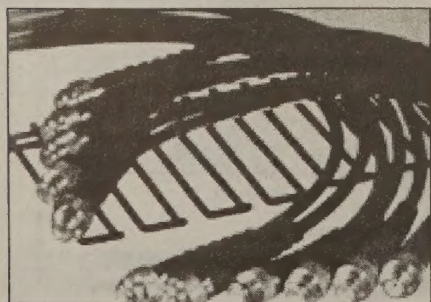
RAYMOND SARRIO

Hams interested in generating community awareness will be excited by these new T-shirts from Ramond Sarrio Company. These eye-catching shirts feature a 4-color design that clearly communicates that amateur radio provides an essential public service when disaster strikes. There is also a circular 2-color logo on the left chest that states, "Amateur Radio—Dedicated to Public Safety." The sweatshirts have the 4-color "WHEN ALL ELSE FAILS" design on the front.

To help amateur radio clubs, a special fund raising program has been implemented: Clubs, without stocking any inventory, can earn up to \$6 on each T-shirt and up to \$8 on each sweatshirt they sell. ARCs can also have their club name or logo printed onto these shirts. All shirts come with a 30-day no questions asked guarantee. T-shirts are priced at \$14.95, sweatshirts \$26.95 plus S&H (CA residents add 7.75% sales tax). For more information



or to order contact *Raymond Sarrio WB6SIV*, 6147 Via Serena St., Cucamonga, CA 91701; (orders) (800) 413-1129, (info) (909) 987-1020. Or circle Reader Service No. 205.



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